UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOUTHERN UTILIZATION RESEARCH AND DEVELOPMENT DIVISION

PROCEEDINGS OF SEVENTH COTTONSEED PROCESSING CLINIC

AT THE

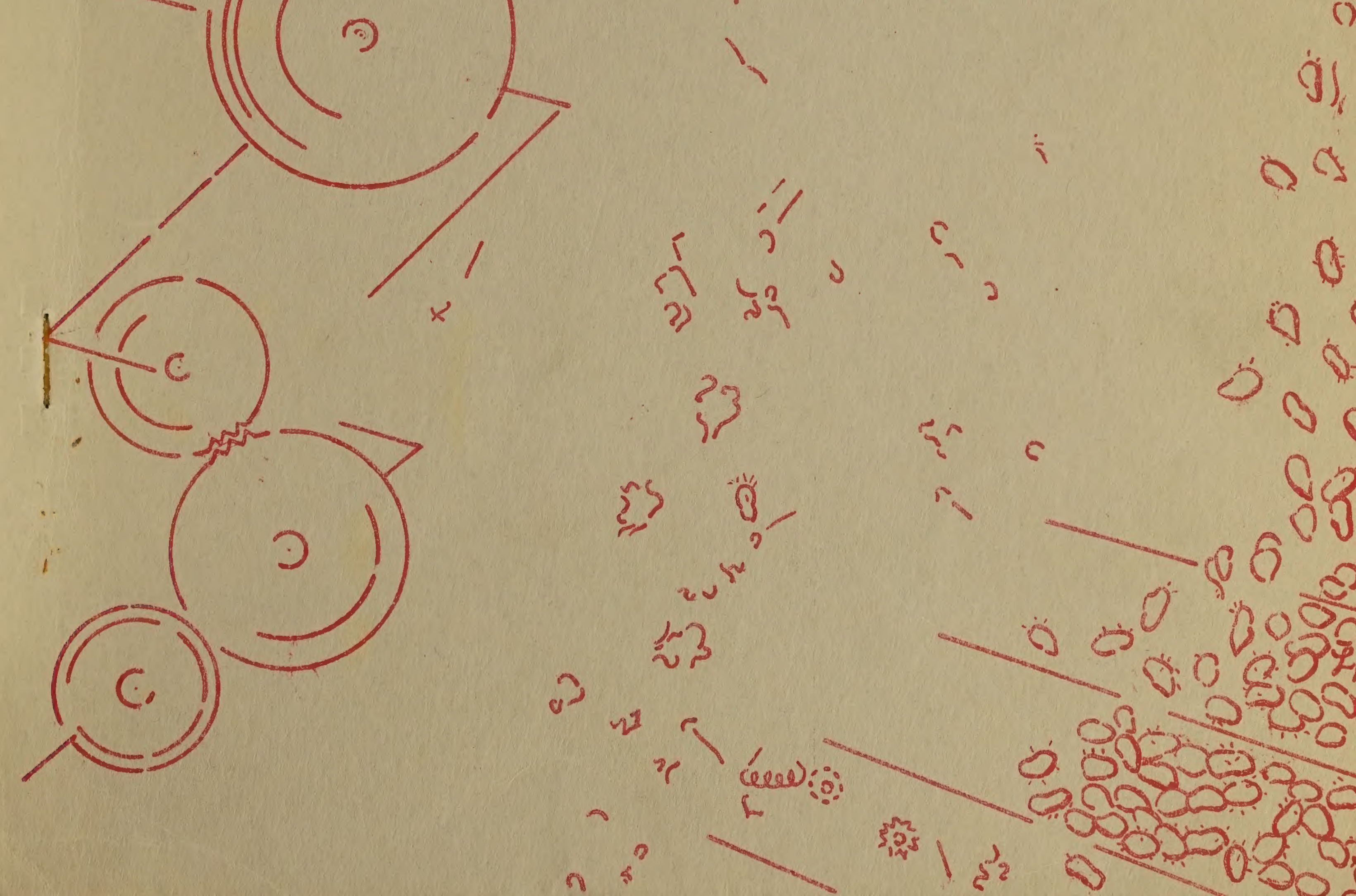
SOUTHERN REGIONAL RESEARCH LABORATORY

NEW ORLEANS, LOUISIANA

IN COOPERATION WITH

VALLEY OILSEED PROCESSORS' ASSOCIATION, INC.

FEBRUARY 3-4, 1958



F O R E W O R D

These proceedings are a summary of the information presented at the Seventh Cottonseed Processing Clinic held at the Southern Regional Research Laboratory, New Orleans, Louisiana, February 3-4, 1958.

Sponsored jointly by the Southern Regional Research Laboratory and the Valley Oilseed Processors' Association, this working conference was attended by eighty-nine representatives of cottonseed oil mills, equipment manufacturers, users of cottonseed products, linters dealers, commercial laboratories, industry associations, and federal agencies in addition to staff members of the Southern Laboratory. The program was arranged by staff members of the Southern Laboratory and members of the Association.

Major attention at the Clinic was focused on the nutritive studies of cottonseed meal, the development of gossypol-free cottonseed, utilization of linters, and problems of cottonseed oil production.

C O N T E N T S

	PAGE
Opening Remarks G. E. Goheen, Acting Director, SURDD	1
Response James Hicky, President, VOPA	4
Developments in Improving the Nutritive Value of Cottonseed Meals for Poultry. Resume' of Feeding Tests V. L. Frampton	4
Significant Differences Between Cottonseed and Soybean Meals from the Standpoint of Animal Nutrition.	
Investigator's Point of View Carl Lyman	5
Producer's Point of View Garlon Harper	6
Feed Manufacturer's Point of View H. L. Wilcke	7
Panel Discussion on Nutritive Value of Cottonseed Meal A. M. Altschul, W. G. Quinn, V. L. Frampton, Garlon Harper and H. L. Wilcke	7
What the Clinic Means to the Oil Milling Industry Ralph Woodruff	9
Prospects of Improving the Quality of Cottonseed Oil Frank G. Dollear	11
Report on Development of A Gossypol-Free Cottonseed Scott McMichael	12
Benefits Resulting from Integrating Oil Processing and Extraction Operations at Cottonseed Oil Mills W. C. Whittecar	13
Material Balances at Cottonseed Oil Mills C. L. Hoffpauir, P. H. Eaves, J. J. Spadaro and J. Pominski	14
Material Balances at Cottonseed Oil Mills Allen Smith	17

PAGE

Panel Discussion
E. A. Gastrock, J. J. Spadaro, T. S. Pryor, J. B. Perry, Jr., Ralph Woodruff, F. G. Dollear, Scott McMichael, W. C. Whittecar, C. L. Hoffpauir, P. H. Eaves, and Allen Smith 22

Second Day

Reports on Developments in the Cleaning of Cottonseed by:
The Southern Division
L. L. Holzenthal 24

Equipment Manufacturers
M. E. Ginaven 25

Oil Mills
J. H. Brawner 29

Report on Current Utilization of Linters
Frank D. Barlow 30

Recent Developments in the Use of Linters for Papermaking
J. J. Spadaro 32

Panel Discussion on Cleaning of Cottonseed and Utilization of Linters
H. L. E. Vix, C. M. McClure, L. L. Holzenthal, M. E. Ginaven, J. H. Brawner, Frank D. Barlow, J. J. Spadaro, and E. A. Gastrock 33

Report of Resolutions Committee 34

Program 35

Attendance List 38

Press Releases 40

OPENING REMARKS

By

G. E. Goheen, Acting Director
Southern Utilization Research and Development Division

It is always a pleasure to have visitors come here to learn about our work, and to give us the benefit of their knowledge and experience. It is an even greater pleasure, however, when old friends return, because then we feel they derive pleasure and benefit from visiting with us, just as we do from visiting with them. Some of you have been coming to these Cottonseed Processing Clinics ever since they were started seven years ago, and we consider you old friends. A few of you may be here for the first time; if so, we are glad you came, and hope that you will return many times in the future. Whether you are a veteran of these Clinics, or a newcomer, it gives me keen pleasure to welcome you to this meeting, both personally and on behalf of the Division.

These contacts with industry are of great value to the scientists working here in the Division; they give us a fresh viewpoint, and keep us informed as to what problems you men in industry have encountered, so that we have a better idea as to what kind of research will best serve you. Meetings such as this provide opportunities for discussion of subjects of mutual interest, and we are very glad to have the privilege of cooperating with the Valley Oilseed Processors' Association in sponsoring these Clinics.

Progress has been made since last year's Clinic on research projects in which you are especially interested, such as the cleaning of cottonseed, the improvement of cottonseed meal for poultry feeding, and other matters directly connected with oil mill operations. Some of the technical people working on these projects will report to you in detail on these accomplishments during the course of the program, so I will leave these subjects to them.

Your attendance at these meetings proves you are interested in research, and since you are so closely associated with the cotton industry, I might mention a few of our recent developments which are attracting considerable interest. Mechanical harvesting and hand-snapping of cotton is increasing rapidly. Our Cotton Mechanical personnel have been working to improve machinery for cleaning trashy cotton at the textile mills, so as to overcome as much as possible the disadvantages of cotton harvested in these ways. Several years ago the SRRL Cotton Opener was released to the textile industry and widely adapted because it makes possible faster and more thorough cleaning. Recently, a patent was allowed on the new SRRL Cotton Opener-Cleaner. This new machine adds a highly efficient cleaning unit to the Opener to give highly efficient cleaning (average 35%) to the opening operation with no increase in horsepower, very little increase in the floor space required, all with only half the lint loss of existing textile machines. You can readily see what this can mean as the cotton industry continues the shift to machine harvesting. Several

textile machinery firms have already requested licenses to manufacture the SRRL Opener-Cleaner.

No doubt some of you have purchased wash-and-wear cotton suits, slacks, or shirts, and like many others, you may have been disappointed because the trousers didn't hold a crease, and seams were not as neat looking as you'd like. We think our Cotton Chemical people have the answer to that in a resin treatment which can be applied and cured after the garment is finished. Under this method, seams are pressed flat, and creases are pressed in to stay, so that after washing the garment retains that neatly tailored, freshly pressed appearance. We are now working on a process by which this treatment can be applied in the ordinary dry cleaning shop.

Another new development is a chemical treatment to make cotton fabric resistant to both water and oil. In experimental tests, droplets of oil remained on the fabric for fourteen days without penetration or staining.

These are just three of our newer developments in cotton research; the two latter have not been commercialized yet, but their potential value is obvious, and they will serve to give you an idea of the progress we are making in other areas of research for the benefit of the cotton industry.

Research on the utilization of agricultural products is advancing and changing rapidly - the four Regional Research Laboratories, which are the major venture of the U. S. Department of Agriculture in this field of scientific investigation, are less than twenty years old, but changes in organization and emphasis to meet the changing requirements of our work have become necessary already.

You may have heard something about the realignment of research functions and personnel which began in the Agricultural Research Service of USDA last year. This realignment, as it affects the Southern Division, took effect at the beginning of this year, on January 10. The provisions of this realignment are the result of long and careful study and planning, both in Washington and here, to make the most effective possible use of the abilities of our scientific personnel and the available facilities.

Instead of the Sections, as you knew them, research of the Division is now conducted in seven research laboratories: the Food Crops Laboratory, Industrial Crops Laboratory, Cotton Mechanical Laboratory, Cotton Chemical Laboratory, and Engineering and Development Laboratory, and two special laboratories, the Plant Fiber Pioneering Laboratory and the Seed Protein Pioneering Laboratory, to carry on research into the fundamental chemistry of Southern agricultural products. This fundamental research is becoming increasingly important as applied research pushes closer to the boundaries of the knowledge we now have about these products; we must know more about them in order to do more with them, both from the standpoint of improving known products, and developing new products. The work of each commodity laboratory is grouped into investigations.

No doubt you will be interested in knowing how this realignment has affected some of the people with whom you have worked most closely. E. A. Gastrock, with whom you are well acquainted for his part in the development of the filtration-extraction process, and other research of interest to oil mill operators, will continue as Head of the Chemical Engineering Investigations, working along much the same lines as heretofore. Dr. E. F. Pollard, who has taken such an active part in making the

arrangements for these Clinics, heads Industrial Analysis Investigations. Both these investigations, as well as Machinery Development Investigations, are a part of the Engineering and Development Laboratory, of which Mr. E. L. Patton is Chief.

Dr. Aaron M. Altschul, formerly Head of the Oilseed Section, is now Principal Chemist of the Seed Protein Pioneering Research Laboratory, where he will have an opportunity to devote his talents as a biochemist to fundamental research in this very important field. Most of the work of the Oilseed Section is now included in the Industrial Crops Laboratory, of which T. H. Hopper is the Chief. All of these people were doing commendable jobs in the positions they formerly held, but we feel their special talents will be employed to an even greater advantage in their new positions.

Again, I welcome you, and hope that the meetings will be both pleasant and profitable.

RESPONSE

By

James Hicky, President
Valley Oilseed Processors' Association, Inc.

Thank you, Dr. Goheen, for the warm and sincere welcome that you have extended to us this morning.

That the Cottonseed Processing Clinic is considered worthwhile and of much value to the industry is indicated by the interest and attendance not only of men directly connected with the mechanics of cottonseed processing, but also men from varied levels of the industry's ramifications.

Too, it pleases me, Dr. Goheen, to note here that in its annual report the Research Committee of the NCPA in 1956 and again in 1957 favored the objectives of our annual processing clinics and complimented those developing and taking part in the programs.

It is therefore a privilege for me, representing the group assembled here, to thank you and your staff for these annual meetings, which you arrange, and also thank you for sharing with us in industry the knowledge gleaned through your efforts and cooperation, on our behalf.

RELATIONSHIPS BETWEEN EGG YOLK DISCOLORATION AND CONSTITUENTS OF COTTONSEED MEAL

By

Vernon L. Frampton
Industrial Crops Laboratory
Southern Utilization Research and Development Division

The chromogen in off-colored eggs is bound to the yolk proteins. The chromogen acts as a pH indicator. The color develops in stored eggs because the yolk becomes alkaline during the storage period. No color develops so long as the yolk remains acidic. It has been demonstrated that the total gossypol content of cottonseed meal is directly proportional to the intensity of the egg color. In addition, lysine in cottonseed meals tends to counteract the effect of gossypol in inducing color. Low gossypol and high lysine meals will induce less discoloration than will high gossypol, low lysine meals.

SIGNIFICANT DIFFERENCES BETWEEN COTTONSEED AND SOYBEAN MEALS FROM THE STANDPOINT OF ANIMAL NUTRITION

From an Investigator's Point of View

By

Carl M. Lyman
Texas A+M College

Amino Acid Composition:

The amino acids which are most likely to be deficient in farm feeds for poultry and swine are methionine, lysine and tryptophan. Cottonseed meal is a little higher in methionine than soybean meal; just the reverse is true for lysine; both meals are good sources of tryptophan. Thus in a ration composed primarily of corn and soybean meal the limiting amino acid is methionine, while in a corn cottonseed meal ration, the limiting amino acid is definitely lysine. An important factor in this picture is that a variable portion of the lysine in cottonseed meal cannot be digested and utilized by the animals. Modification of processing conditions to minimize this factor is one of the opportunities for the future.

Processing and Nutritional Value:

Both cottonseed and soybeans contain substances which must be destroyed, modified or removed during processing if the meals are to be used effectively as feed for poultry and swine. The chemical nature of these substances are quite different in the two products. Raw soybeans contain a substance which blocks the process of protein digestion (tryptic digestion) in the animal. In addition, raw soybeans contain a second growth inhibitor called soyin. Both of these substances are readily destroyed by moist heat treatment during processing. To date the evidence is conclusive concerning only one substance which must be altered or removed from raw cottonseed during processing. This substance is called gossypol. Fortunately gossypol has no effect at all on cattle and sheep. Gossypol, like soyin and the tryptic inhibitor in soybeans can be inactivated by moist heat. A complicating factor is that under certain milling conditions gossypol becomes bound to the protein with a marked reduction in protein quality. Excessive heat treatment results in poor protein quality in both cottonseed and soybean meals probably due to reactions of the protein with carbohydrates. <u>It is much more difficult to maintain high protein quality during cottonseed processing than is the case with soybeans.</u>

Crude Fiber:

Feeding trials have repeatedly shown that for best results, feed ingredients of low fiber content should be used in rations for poultry

and swine. As cottonseed meal is typically produced today, its high hull content is a distinct disadvantage. The soybean industry is meeting the challenge by placing on the market a meal of high protein content. Will the cottonseed industry do as much?

SIGNIFICANT DIFFERENCES BETWEEN COTTONSEED AND SOYBEAN MEALS FROM THE STANDPOINT OF ANIMAL NUTRITION

From the Producer's Point of View

By

Garlon A. Harper
National Cottonseed Products Association, Inc.

Cottonseed and soybean meals are both competitive and complementary. Each has individual inherent characteristics which present problems and advantages in processing and use. These individual differences are important only to the extent that they affect the economy and productivity of the complete ration.

In cotton growing areas, cottonseed meal usually is the protein concentrate of choice for ruminants. It usually provides a unit of palatable protein at lowest cost and its higher phorphorus content is of advantage when it is fed straight in phosphorus-deficient areas.

Soybean meal is preferred in rations fed simple stomach animals which have digestive systems unadapted to extensive synthesis or rearrangement of nutrients essential to animal functions. Feeding tests have indicated that a combination of high-quality cottonseed and soybean meals produces equal or superior growth to that from either concentrate alone.

Nutritionists consider that soybean meal is somewhat more adequate in essential amino acids, primarily because of its lysine content. The apparent lysine deficiency of cottonseed meal may be more a function of processing than inherent in the seed, and it may be possible to process cottonseed meal which will not be limited in use by lysine deficiency. Cottonseed meal contains slightly more methionine, the most critical amino acid in soybean meal. Ratios between amino acids in rations may be more important than empirical levels which may account for the good results from mixtures of these meals.

Gossypol is cottonseed meal's most difficult problem because of its unfavorable effect on simple stomach animals and its reduction of protein quality. Elimination of these effects, through plant breeding or processing, would enable cottonseed meal to compete in poultry and swine rations on a unit of protein cost basis.

Cottonseed meal contains about 6% more fiber than 44% protein soybean meal and 10% more than 50% protein soybean meal, providing an obstacle to highest feed conversion in poultry and swine rations. Fiber reduction is dependent on establishment of a satisfactory price differential between high- and low-protein meals which it appears must be preceded by solution of toxicity and protein quality problems.

SIGNIFICANT DIFFERENCES BETWEEN COTTONSEED AND SOYBEAN MEALS FROM THE STANDPOINT OF ANIMAL NUTRITION

From the Feed Manufacturer's Point of View

By

H. L. Wilcke
Ralston Purina Company

There are some differences in cottonseed and soybean meals which are definitely affected by processing. The availability of certain amino acids such as methionine and lysine is affected by the amount of heat applied to the meats or the meal in processing. The soybean carries a trypsin-inhibitor factor which is inactivated or destroyed by heat; therefore, a certain amount of heat is not only desirable but necessary to bring out the full nutritive value of the protein from the soybean. Much less heat is desirable in processing cottonseed. The mode of operation of this trypsin-inhibitor is not completely understood but the net result of its activity is reduced availability of amino acids.

Excessive amounts of heat in processing either through the direct application of heat or due to pressure and friction in the process itself make the amino acids less available to the animal.

The physical characteristics of the meals from cottonseed and soybeans are affected by the method of processing. Cottonseed meals produced by the prepress solvent or by solvent methods may be extremely low in fat and quite dusty. This is objectionable from a handling as well as a palatability standpoint. While the meal produced from the soybean by the solvent method is equally low in fat the handling characteristics are much better.

With the emphasis on increased caloric content of manufactured feeds there is a corresponding objection to fiber in the protein supplements. The practice of returning or adding hulls to the final cottonseed product results in a protein supplement of lower energy content and a product that is less desirable for rations for non-ruminants. While meals with the hulls added are satisfactory for ruminants at the present time, there is growing evidence that the feed manufacturing industry will demand products with lower fiber for ruminants as well as non-ruminants in the future.

PANEL DISCUSSION ON NUTRITIVE VALUE OF COTTONSEED MEAL

Fowler: Dr. Lyman, is there any reason to believe protein quality has an effect on feeding ruminants?

Lyman: Protein quality determinations on non-ruminant animals cannot be applied to ruminants. With casein, yes, and other digestible materials, but it has less value with meals whose nitrogen

is liberated slowly. All cannot be measured. Experiments indicate some relationship between processing and nutrition.

Smith: Dr. Wilcke, in regard to fiber, what causes its detrimental effect? What can be done to convert fiber in meal, so it can be used in other than ruminants?

Wilcke: Possibly by the use of enzymes to break down fiber. Work was done in Washington on barley-corn. In Canada, enzymes are used in young animals which haven't been producing. Enzymes are used in Missouri to break down fiber so it can be used by swine. The work is not complete.

Hutchins: Dr. Frampton, what is the range of free and total gossypol covered in egg work?

Frampton: Lower value zero for both; in control, maximum: 1.4% total gossypol; 0.5% free gossypol.

Moore: Dr. Wilcke, will any incentive be offered for producing high protein, low fiber meals?

Wilcke: The same question is faced by the soybean industry. In practice premium is being paid. In cottonseed meal, if the feed industry becomes convinced that combination of both is better than either alone, a premium will be paid. Until hulls can be marketed premium is held in abeyance. Leaves it in the future.

Woodruff: Is there any truth to rumor of detrimental effects by addition of inedible fats to cottonseed meal?

Lyman: (Partial answer). There are some bad effects in using large amounts. When only the amounts required for pelleting are used the levels are way under those which can cause trouble. High level is used for high energy.

Wilcke: This is not a problem of fats per se. Any level of bad or contaminated fat will produce detrimental effect.

Woodruff: Dr. Wilcke, do you care to comment on origin of fat?

Wilcke: No.

Hutchins: Which is most promising field for improving cottonseed meal? How about reducing or eliminating gossypol?

Quinn: 50% cottonseed meal can be made, but lowering of fiber content only avenue visible at present. To improve protein, and reduce fiber and lower gossypol, chemical treatment rather than heat should be used. The industry is in state of flux.

Wittecar: Will higher nitrogen solubility offset gossypol?

Lyman: In swine feeding there were two distinct problems: (1) necessity of reducing free gossypol; (2) maintaining high protein quality. Only one-half problem met high nitrogen solubility with high gossypol.

French: In feeding test is high nitrogen solubility very reliable in middle ranges?

Altschul: In making study on variables both Dr. Frampton's and Dr. Lyman's groups report lysine content important.

Lyman: In intermediate ranges there is no correlation between nitrogen solubility and feeding efficiency. But 75% nitrogen solubility meal from solvent extraction is indicative of high protein meal.

Frampton: All evidence points to the fact that several factors are indicative of quality. In extreme cases perhaps nitrogen solubility

does indicate quality but not in most cases. Lysine and other amino acids may be in unbalance and other constituents may have relationship.

Wilcke: One further comment on fats: No one knows what toxic principles are!

WHAT THE CLINIC MEANS TO THE OIL MILLING INDUSTRY

By

Ralph Woodruff
Delta Products Company

This is a large order -- the task of evaluating the benefits of these annual Processing Clinics to the Oil Milling Industry. It would be rather presumptuous for me to declare that I speak for the Industry. Rather, I believe, I should endeavor to set forth the usefulness of the series of years of study as it applies to one of the beneficiaries.

We, who are in agriculture and agricultural processing and who, therefore, produce the food and fibre for so much of the world's needs have, as always, a very vital role to play in this great world-wide drama that is being enacted.

As I looked back over the years that have elapsed since we set up our first Clinic, I could not help but reflect upon the progress that has been made during the time. We were just beginning to hear of a new process called Filtration-Extraction. It looked quite promising. Now, Filtration-Extraction is a practical commercial process for the extraction of vegetable oils. The credit for development of this idea belongs to the Laboratory staff and not to the Clinic and I would not for one moment infer otherwise, but the two brain children grew up together and I think this is worthy of comment.

I looked back to that first round table discussion, where we were confronted with the problem of the necessity for making a better quality lint. I immediately recalled the advice that we got and that was to the effect that we would first have to clean our cottonseed. The next question was -- how to do it. Most of us found that the first thing we had to do was double the size of our seed cleaning equipment. When we had increased our seed cleaning machinery, we found that we did not have as much of a problem in the cleaning of our lint. The cleaning of the seed did not solve the entire lint cleaning problem, but it did put us in position to make some progress in lint cleaning technique. Without proper seed cleaning practice, we could not have cleaned our lint.

We also began to ask questions of the trade as to what they wanted. We asked the paper trade to come in and tell us what they needed. They sent representatives to work with us and some of us followed up on what we had learned here and began to make lint for the paper trade and are now furnishing this industry some part of its basic material.

The symposium on linters which was a part of the Fifth Cottonseed Processing Clinic in 1956 was the best prepared and executed of any development up to that time. I thought it was one of the highlights of all of the meetings. It was the first bringing together of all of the segments of the linters trade. There, we learned that first cut linters pulp compared favorably with rag pulp; that we were beginning to recover some ground that we had lost to foam rubber in the automobile trade; and in the paper industry there was a vast potential market for linters. We got an idea as to what the trade wanted and we began to try to make what they wanted, and we began to sell lint through some new outlets and into some new channels. I think this was the high point of the linters study.

While this Clinic had been born of a need, an acute need, to determine how to make a marketable lint as we progressed and worked out some of our problems with respect to seed cleaning and linters cleaning, we found that other troubles were plagueing us. With the advent of the high-speed expeller, the pre-press plant and some changes in straight solvent extraction there appeared to be some imbalance in the recovery of oil. A study of this problem, pointed up the apparent conclusion that the dollar and cents value on the oil produced from a ton of cottonseed was not affected as seriously as might have been assumed by a comparison of apparent yields.

Over the period of years, improvement in quality of cottonseed protein has been an important part of our work. This Laboratory, working with other departments within the Department of Agriculture, has kept us informed and has brought us up to date from year to year on this matter with such an absolute completeness that this one phase of the work would have been worth the effort necessary to the conduct of all of these Clinics. Considerable progress is being made toward improvement of cottonseed protein and its uses and no small part of the credit belongs to the stimulus provided by these Clinic meetings and to the type of information that was made available here.

I have touched on the highlights only. I do not have the time to enumerate, nor would you have the time to listen to a recitation of the many benefits that have been derived from these meetings. At the risk of appearing repetitious, I reiterate what I have said before. This Laboratory was built to serve the needs of agriculture in the lower Mississippi Valley. We are a part of agriculture in that area. The facilities of this research institution are available to us. We should use them more. The practical benefits that are to be obtained in these clinics are substantial and lasting and I do not believe that one can attend a clinic without benefiting. These meetings have been unique because they are composed of managers and superintendents; salesmen and sales representatives; manufacturers and consumers; technical men and advisors; research men and students; all coming to a common meeting place and freely discussing mutual problems. These meetings have been of great value to me and to the companies that I have represented during the time that I have been coming here. I believe they have been so to everyone who has attended.

PROSPECTS FOR IMPROVING THE QUALITY OF COTTONSEED OIL

By

Frank G. Dollear
Industrial Crops Laboratory
Southern Utilization Research and Development Division

Color is the quality in which cottonseed oil is not competitive with soybean oil and animal fats for use in high quality shortening. About 20% of the cottonseed oil produced is too dark in color to give premium quality shortenings. Such oil must be re-refined and in some cases blended with lighter colored oils. Improvement of cottonseed oil color has been classed by our advisory committees as the number one oil problem.

The major pigment in the cottonseed is gossypol (or gossypol-like substances) which occurs in discrete pigment glands. Some seed contain more pigment than others depending upon the variety, location and conditions of growth. Bollie seed contains in addition red pigments that give some of the reactions of anthocyanins. Native gossypol is alkali soluble and should be removed on alkali refining. However, in practice some of the gossypol has generally undergone changes affecting its acidic character so that it is not removed or is incompletely removed on refining and bleaching. This color fixation or reversion does seem to be a function of the content in the crude oil of gossypol-like pigments.

Seed storage affects oil color. Cooler seed can be kept better. The type of processing also affects oil color as do the conditions of storing crude oil before it is refined. Changes in a type of processing in the cottonseed industry have accentuated the oil color problem. The seed processor is limited in what he can do in controlling oil color because he wants the gossypol-like pigments neither in the meal nor in the oil and must operate to secure good production rate, highest yield of oil, of low refining loss, and high quality meal.

Crude cottonseed oil thus appears to be the best starting point for research to improve color. First is the mechanical approach. Alkali has been used for refining since the inception of the use of cottonseed oil as an edible product. Advances have been made in mechanics of mixing oil and alkali to improve color. High shear refining has been a subject of papers of this Laboratory as well as a patent issued in 1954 to Markley and Feuge. Last year a patent was issued to Porter A. Williams covering an improved method of re-refining where concentrated alkali of at least 40° Baume' is reacted intimately and almost instantaneously with oil to give good color and lower losses than conventional re-refining.

The physical approach involves the bleaching of oils with adsorbents such as bleaching clays and carbons. Adsorbents now in use readily remove yellow carotenoid type pigments but have limited effect on the red colors. Opportunities exist for the development of new adsorbents which have greater attraction for these red pigments. Possibilities exist for the development of entirely new processes for purifying crude oils.

The chemical approach has been the subject of recent investigations at this Laboratory. Gossypol and gossypol-like pigments have a high degree of chemical reactivity. The most promising chemical so far tested is known as diethylenetriamine. It is mixed with the oil before refining, the oil is then refined and bleached in the conventional manner. Reactions of gossypol, particularly those which might be useful in reducing oil color are also being investigated under contract at the University of Tennessee.

The mechanism of color fixation is not well known at present. Gossypol reacts with amino groups, for example amino acids from meal, or amine compounds from gums or phosphatides. This can give red products which may be formed through an oxidation reaction and have been postulated as being ortho-quinones. Gossypol itself can react with the oil.

Oil color measurement is the subject of a project supported by the National Cottonseed Products Association to develop more basic information on the pigments in the oil and develop a more scientific method to guide refining practices.

DEVELOPMENT OF GOSSYPOL-FREE COTTONSEED

By

Scott McMichael
U. S. Cotton Field Station, ARS

Gossypol found in cottonseed is localized in the pigment glands. In the development of gossypol-free cottonseed the problem of the cotton geneticist was therefore to develop a strain of cotton having no pigment glands. Gland elimination would not only remove the gossypol from the seed but also remove undesirable pigments as well. The primary source of glandlessness was obtained from a wild American cotton from central Arizona that had been grown by the Hopi Indians for many centuries. This cotton, known as Hopi Moencopi, is a botanical variety of Gossypium Hirsutum, the species containing upland cultivated cottons. Hopi M. is variable in its gland content and under selection pressure low gland lines were developed. Selected Hopi M. plants were then crossed with a partial glandless mutation found by the writer a few years previously. This mutation known as glandless-one has an almost normal glanded seed, but the bolls and stems are glandless. After growing the cross, Hopi M. x glandless-one, for several generations and screening many thousands of seedlings in the greenhouse, a glandless seeded selection was found. The breeding of glandless seed into commercial strains of cotton is now underway at the Shafter, California station. This process will take several years of backcrossing (crossing selected offspring back to the commercial type parent). The segregating generation of the first backcross will be in our 1958 nursery.

Gossypol analyses made by the Southern Regional Laboratory on partial glandless seed lines have confirmed the relation of gland number to gossypol content. Preliminary feeding tests conducted at the University of California show that meal from glandless-seed can be fed to laying hens.

Other tests which glandless-seed must meet are agronomic, yield and quality of lint.

INTEGRATED OIL PROCESSING AND EXTRACTION OPERATIONS

By

W. C. Whittecar
Plains Cooperative Oil Mill

I would like to go back a few years to 1952 when we at Plains Cooperative Oil Mill purchased and installed a direct extraction plant from French Oil Mill Machinery Company. This plant originally designed for 300 tons per day on direct extraction has been stepped up now to do 600 tons per day.

Solvent meal was not accepted very readily by feed manufacturers and feeders, with the result that solvent meal was very hard to move unless sold at a discount.

Under the direction and foresight of Mr. Roy Davis, we started a program to make improvements on our direct extracted meal. The result is our present operation, which is water-wash degumming and we now produce meal and pellets that have a very wide acceptance in a number of states. This operation has enabled us to produce a higher fat meal with a higher nutritive value than most cottonseed products. We have a meal with a very high nitrogen solubility; a meal that will pellet to the satisfaction of the feeder -- not too hard and with a minimum of fines in the bag.

In improving our meal with lecithin extracted from the oil, we reduced our refining loss and increased our meal weight. We feel that this operation has brought additional revenue to the plant, besides placing our products in a position where they are readily accepted by the trade.

If oil mills are able at least to once refine their oil, using the gum or lecithin in their meal, they will have a twofold profitable operation, increasing the feeding value of their meal and being able to sell a much better oil. Adding the lecithin or gums to the meal in process will increase the fat content and increase pelleting and mixing qualities of the products.

We have done considerable work on continuous miscella degumming and refining, which we believe should give us better products than we now have. At the present time, we are not in a position to give you all of the correct answers to this new process. We are installing some additional equipment to make our continuous miscella degumming and refining completely automatic, which will enable us to produce a very fine once-refined oil without any waste being lost to the mill.

We will be glad to answer any questions on our present operation, and, as soon as we feel that we have the answers to our continuous miscella degumming and refining, we will be glad to pass on to anyone interested in our results from the process.

MATERIALS BALANCES AT COTTONSEED OIL MILL

By

C. L. Hoffpauir, Assistant Director, P. H. Eaves,
J. J. Spadaro, and J. Pominski
Engineering and Development Laboratory
Southern Utilization Research and Development Division

In an effort to find a solution to the "oil loss" problem a limited period mill scale balance test was conducted at a commercial screw press equipped mill. Representatives of Barrow-Agee Laboratories, Inc., and a screw press manufacturer were present to observe and assist the investigation.

The study extended over a period of 8 days during which time approximately 558 tons of cottonseed were weighed into and processed through the mill. The mill equipment was emptied to the lowest possible level before starting the run and emptied to the same level at the conclusion of the test.

The total "as is" weight of seed into the mill for this study was 1,117,081 lbs. The seed were weighed into the mill by a bonded weighman over certified platform scales in trucks carrying about 6 tons of seed per load and the weight reported is as accurate as could be determined.

Totaling up the oil accounted for in all of the output products we find that 199,013 pounds out of the 200,088 pounds of theoretical input oil can be accounted for, equivalent to an apparent loss of a total of 1,075 pounds of oil, or 1.92 pounds of oil per ton of "as is" input seed. This leaves about 0.5% unaccounted for.

It is realized that to many of you, the failure to account for 1.92 lbs. of oil per ton of seed will no doubt appear to be a real and significant loss of oil. Obtaining this balance required weighing into and out of the mill a total of nearly two and a quarter million pounds. This operation alone entailed an unavoidable uncertainty, with respect to gross weight, of about 2200 pounds. In addition some 81 samples were drawn. Unquestionably some small changes in the moisture content of these samples could have occurred between the time they were originally taken and the time when they were analyzed for moisture. A very small change in the moisture content of the seed alone between sampling and analysis could account for the apparent imbalances found. In view of the foregoing, we consider that in this particular mill scale study, no excessive loss of oil was found.

The following tables show the weight and material balances and distribution of the seed components to the byproduct and waste materials determined in this study.

Table I

Overall Weight Balance

	Material	"As is" Material	Moisture in Material	Moisture free Material
		Pounds	Pounds	Pounds
Input	Cottonseed	1,117,081	111,135	1,005,946
	Calcite	19,508	--	19,508
	Total	1,136,589	111,135	1,025,454
Output	Trash[a/]	3,939	347	3,592
	Linters	99,127	6,931	92,196
	Motes	2,281	192	2,089
	Hulls	249,400	28,206	221,194
	Meal	560,900	34,717	526,183
	Crude Oil	179,600	359	179,241
	Cleanup[b/]	1,957	207	1,750
	Total	1,097,204	70,959	1,026,245

Imbalance + 791 pounds
Recovery 100.08 %

a/ Trash includes sand, fiber trash, Bauer cleaner trash, and grabbots.

b/ Cleanup includes linter room sweepings, press room cleanup, and sludge in press room oil elevator pit.

Table II

Crude Oil and Nitrogen Balance

Material	Moisture Free Material Pounds	Nitrogen in Material %	Nitrogen in Material Pounds	Crude Oil in Material %	Crude Oil in Material Pounds
Input					
Cottonseed	1,005,946	3.85	38,725	19.89	200,088
Output					
Sand and trash	1,513	2.45	37	5.42	82
Fiber trash	591	4.40	26	15.74	93
Bauer trash	641	3.43	22	10.76	69
Grabbots	847	2.01	17	7.79	66
Linters	92,196	0.38	354	0.52	481
Motes	2,089	1.05	22	3.35	70
Hulls	221,194	0.60	1,318	0.51	1,133
Meal	526,183	7.01	36,908	3.24	17,058
Oil	179,241	--	--	100.00	179,241
Cleanup	1,750	3.83	67	41.14	720
		Totals	38,771		199,013

Gain or loss - Overall--	+ 46	- 1,075
Pounds per ton of "as is" seed processed--	+ 0.08	- 1.92

MATERIAL BALANCES AT COTTONSEED OIL MILLS

By

Allen Smith
Perkins Oil Company

This is the third report to you on a study of hidden or unexplained oil loss. If there is not a greater response next season perhaps this will be the final report. The first report covered 89 mills, second 69 and this past season 70 mills.

In the season of 1955-56, I reported that after finishing our regular crush some 5000 tons of seed were transferred from our West Memphis Plant to Perkins. We reported an oil loss of 9 pounds on our regular crush. On the 5000 ton crush after changing our cooking process we were able to account for all the oil yield with no loss.

Season 1956-57 at both plants the same process or procedure was followed as was used on the 5000 ton crush at Perkins the latter part of season 1955-56.

The results obtained at both Perkins and West Memphis for season 1956-57 processing as previously explained are as follows: At Perkins the actual yield was less than 2 pounds smaller than the calculated. At West Memphis the actual yield was slightly more than 2 pounds greater than calculated or expected.

Table No. I shows data covering all mills of the hydraulic process listing (a) moisture range, (b) number of mills reporting, (c) average pounds of oil difference, (d) average x value, (e) value variation and (f) average net value per ton of seed.

Table No. II contains data for screw press or an expeller with the same grouping as in Table No. I.

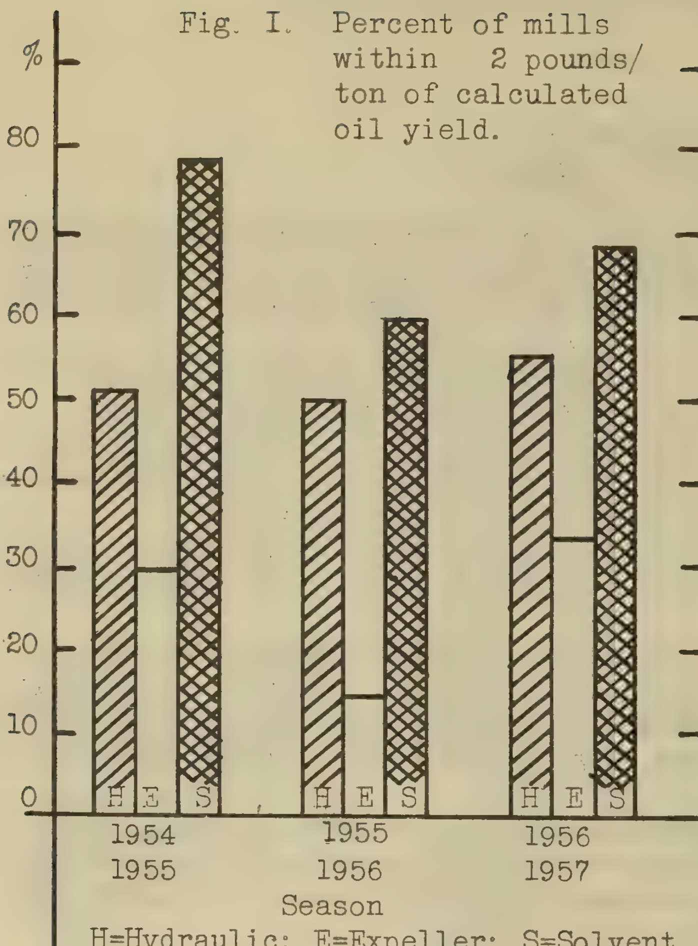


Fig. I. Percent of mills within 2 pounds/ ton of calculated oil yield.

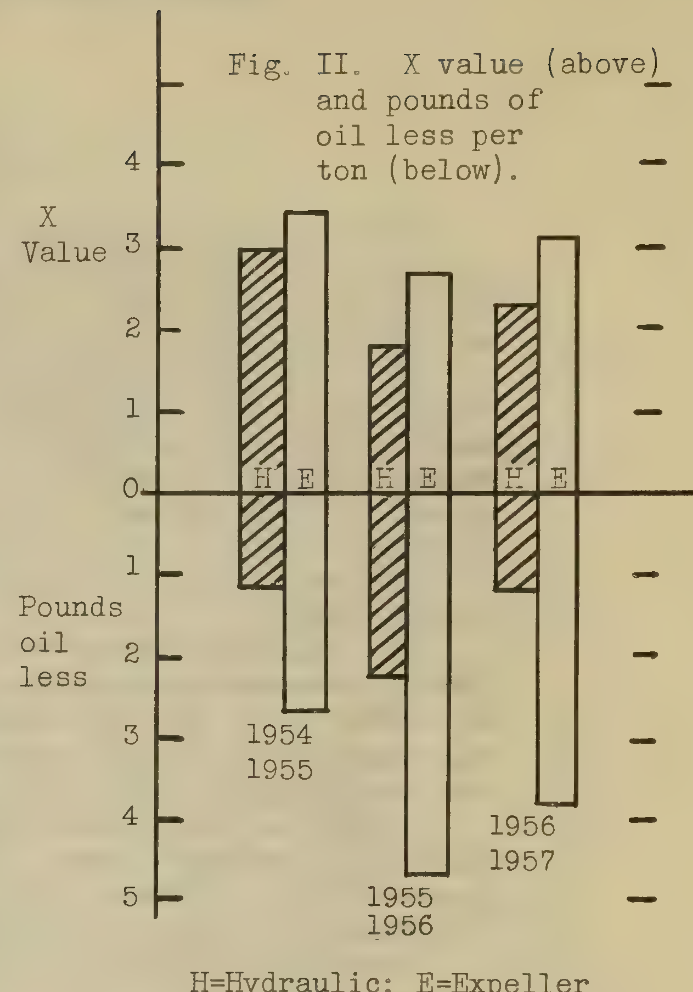


Fig. II. X value (above) and pounds of oil less per ton (below).

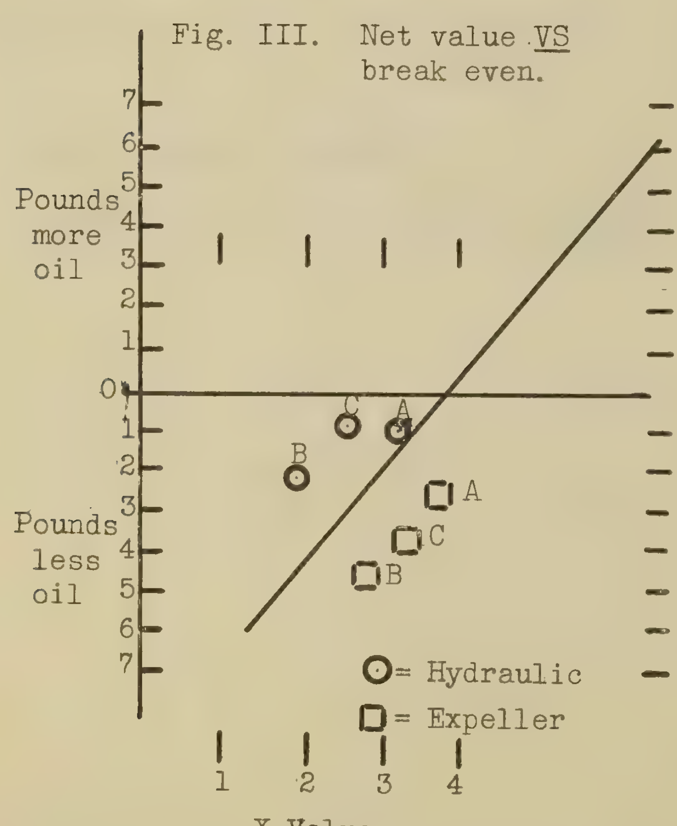


Fig. III. Net value VS break even.

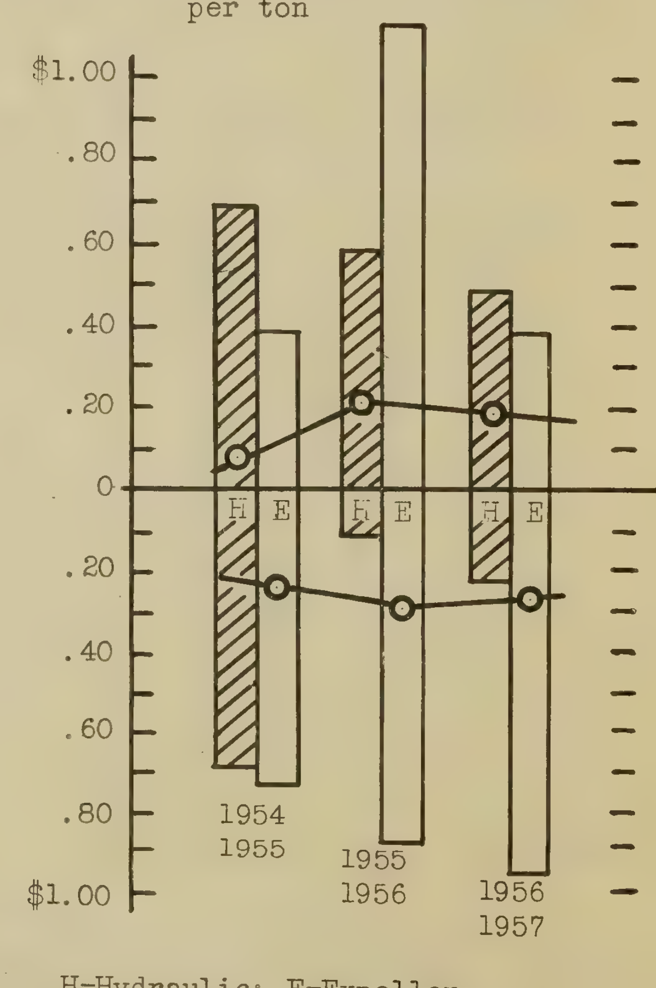


Fig. IV. Net value and variation per ton

I. TYPE OF PROCESS ------ HYDRAULIC

Mois. Range in Seed Milled %	Number of Mills Reported (Season)			Average Lbs. Oil Difference (Act. vs. Cal.) SEASON			Average X Value SEASON			BASIS- PAR- WHEN NO LOSS OR GAIN IN OIL IS REPORTED AND X VALUE = 3.6 (NET VALUE/TON - $) VARIATION PER TON SEED ($)			NET VALUE PER TON (AVER. $)		
	1954-1955	1955-1956	1956-1957	1954-1955	1955-1956	1956 1957	1954-1955	1955-1956	1956-1957	1954+ 1955	1955+ 1956	1956+ 1957	1954+ 1955	1955+ 1956	1956+ 1957
13.1-14.0	3	1		+ 1.17	- 5.0		2.93	- 0.50		+0.246 +0.348			+ 0.314	+ 0.484	
12.1-13.0	7	1	1	+ 1.64	- 1.0	1	2.64	1.30	2.8	+0.020 +0.874			+ 0.394	+ 0.452	+ 0.292
11.1-11.0	3	3		- 2.5	0		2.16	1.73		-0.420 +0.632	+0.140 +0.828		+ 0.100	+ 0.415	
10.1-11.0	4	10	6	- 1.5	- 3.77	- 0.83	2.37	2.02	1.75	-0.900 +0.916	-0.392 +0.620	+0.232 +0.633	+ 0.145	+ 0.020	+ 0.317
9.1-10.0	13	8	9	- 2.58	- 0.60	+ 0.11	3.11	1.79	2.79	-1.032 +0.575	+0.096 +0.681	-0.452 +0.624	- 0.140	+ 0.374	+ 0.206
8.1-9.0	8		4	- 2.50		- 5.0	3.16		2.08	-0.924 +0.296		-0.336 -0.016	- 0.140		- 0.135
7.1-8.0	7	1		+ 0.11	- 5.0		3.94	3.40		-0.948 +1.202		-0.16 -0.33	+ 0.169	- 0.452	
TOTAL	45	24	20	- 51.28	- 53.50	- 23.0	136.52	43.91	46.73	-31.426 +30.979	-2.732 +14.132	-4.18 +9.808	+ 2.823	+ 4.921	+ 3.508
AVERAGE				- 1.14	- 2.23	- 1.15	3.03	1.83	2.34	--0.698 +0.688	-0.114 +0.589	-0.209 +0.490	+ 0.063	+ 0.205	+ 0.175

II. TYPE OF PROCESS ----- SCREW PRESS OR AND EXPELLER

Mois. Range in Seed Milled %	Number of Mills Reported (Season)			Average Lbs. Oil Difference (Act. vs. Cal.) SEASON			Average X Value SEASON			BASIS- PAR- WHEN NO LOSS OR GAIN IN OIL IS REPORTED AND X VALUE = 3.6 (NET VALUE/TON - $) VARIATION PER TON SEED ($)			VARIATION NET VALUE PER TON (Average $)		
	1954-1955	1955-1956	1956-1957	1954-1955	1955-1956	1956-1957	1954-1955	1955-1956	1956-1957	1954+1955	1955+1956	1956+1957	1954+1955	1955+1956	1956+1957
13.1-14.0		1			- 5.0			2.00						- 0.116	
12.1-13.0		2			- 4.5			0.40			- 9.900 + 0.624			- 0.354	
11.1-12.0	3	12	5	+ 2.0	- 6.58	- 2.8	4.63	2.71	2.06	--0.924 + 0.588	- 1.208 + 1.436	--0.408 + 0.766	- 0.047	- 0.444	+ 0.090
10.1-11.0	7	15	3	- 6.12	- 3.72	- 7.67	2.93	2.65	2.73	- 0.904 + 0.112	- 0.634 + 1.436	- 0.928 - 0.068	- 0.451	- 0.144	- 0.558
9.1-10.0	9	3	22	- 3.26	- 5.67	- 3.6	3.47	3.03	3.25	- 0.652 + 0.444	- 1.244 + 0.156	- 1.200 + 0.490	- 0.295	- 0.430	- 0.276
8.1-9.0	10	1	3	- 3.52	- 3.0	- 4.67	3.75	4.60	3.70	- 0.788 + 0.158		- 0.800 - 0.090	- 0.388	- 0.540	- 0.491
7.1-8.0	4	3	4	+ 3.55	- 0.87	- 2.15	3.15	4.00	3.30	- 0.320 + 1.182	- 0.836 + 0.336	- 0.528 + 0.228	+ 0.436	- 0.180	- 0.143
6.1-7.0			5			3.78			3.52			- 0.844 + 0.066			- 0.359
TOTAL	33	37	42	- 87.18	- 171.38	- 157.72	115.73	100.76	131.89	-24.128 +12.852	-32.046 +41.496	-39.956 +15.671	- 7.981	- 10.698	- 11.136
AVERAGE				- 2.64	- 4.63	- 3.76	3.51	2.72	3.14	- 0.731 + 0.389	- 0.866 + 1.122	- 0.951 + 0.373	- 0.242	- 0.289	- 0.265

The X value is calculated as follows:

X = % loss - 3 x % F.F.A. PAR X = 9 - 3 x 1.8 = 3.6

Its relation to refining loss and quantity of oil when yields are 300 and 350 pounds, respectively, of crude oil per ton of seed is as follows: 300 pounds of oil at \$0.10 and 9% loss value = 300 x 0.10 = \$30.00. How many pounds of oil at same price and 8% loss would have the same value?

$$\text{pounds of oil} = \frac{30.00}{(9\text{-}8) \times 3/4 \text{ of } 1\% \text{ of } \$0.10 \quad + \ \$0.10}$$

$$= \frac{30.00}{(1 \times .75 \times 0.001) + .10} = \frac{\$30.00}{\$0.10075} = 297.77 \text{ pounds of oil}$$

difference = 300 - 297.77 = 2.23 pounds.

Therefore 1% loss or X value = 2.23 pounds of oil.

In like manner solve for pounds of oil when yield is 350 pounds:

X value (pounds) - oil (pounds) = 350 - 347.39 = 2.61 average = $\frac{2.23 + 2.61}{2}$ = 2.42 or (approx.) = 2.4 pounds of oil.

Example

9% loss - 3 x 1.5 F.F.A.	= 4.5 X value
8% loss - 3 x 1.5 F.F.A.	= 3.5 X value
1% loss	1.0 X value

Figure No. I shows the percent of mills hydraulic, screw press and solvent that reported within plus or minus two pounds of calculated yields for the past three seasons.

Figure II shows the relation of X value or refining loss to the hidden or unexplained oil loss for hydraulic and screw press or and expeller for the past three seasons.

Figure No. III shows the relation of the comparative net value for hydraulic and screw press with relation to the break even line. The X value and pounds of oil difference from calculated is the basis for arriving at points A, B and C. (Hydraulic) A' B' and C' (Screw Press) for season 1954-1955, 1955-1956, and 1956-1957 respectively.

The final Figure No. IV shows graphically the comparative variation in dollars per ton for hydraulic and screw press, covering the past three seasons.

It may be pointed out that for hydraulic process the net results are slightly improved over the first season 1954-1955. The results for 1956-57 are slightly less than for 1955-56, but still greater than for 1954-1955. The picture for screw press or and expeller is slightly improved over the previous season but hardly enough to be back where it was in 1954-1955.

PANEL DISCUSSION

The following material, listed by subject, is a summary of pertinent information from the panel discussion.

Prospects for Improving the Quality of Cottonseed Oil by F. G. Dollear

Diethylenetriamine treatment of oil probably has the same effect on the fatty acid content of the refined oil as the normal refining treatment, since the oil is also subjected to an alkaline treatment. One of the major problems is to remove the last traces of diethyleneamine from the oil. There are other problems; diethylenetriamine is costly and it involves additional handling. Further evaluations on the refined oil are needed; will it hydrogenate and will it have normal flavors, stability, etc? The effects of this treatment on soapstock have not been worked out and evaluated.

Report on Development of a Gossypol-Free Cottonseed by Scott McMichael

Dr. McMichael would not predict when commercial production of gossypol-free cottonseed would be practical. The seed is not now good enough to put in their breeding nursery. When it is, it would require about 5 years to produce enough seed for all the cotton growers in California. However, they would release seed before this time if there is a demand for it. It can now be obtained for experimental work, if requested for specific purposes. The desirable properties of a cottonseed known as Glandless-One have been successfully transferred to commercial cotton. Dr. McMichael said that it is reasonable to believe that glandless traits can be transferred into commercial cotton. He had no data on processing tests of oil processed from glandless seed. However the crude oil looks very light and was estimated to be between 4 and 5 Lovibond red.

Benefits Resulting from Integrating Oil Processing and Extraction Operations at Cottonseed Oil Mills by W. C. Whittecar

In Mr. Whittecar's opinion, extraction should not proceed to below 1% residual lipides in the extracted meal. As for oil losses, at the end of the year his plant had a better yield than expected.

Material Balances at Cottonseed Oil Mills C. L. Hoffpauir, P. H. Eaves, and Allen Smith

The mill scale test represented a normal operating condition of the mill. The mill has been adding about 4% calcite to meal for years. A precise neutral oil balance could not be made starting with cottonseed because data on free fatty acid changes were unavailable. A neutral oil balance, made on the basis of some reasonable assumptions and starting with the meats, indicated that there was no significant loss of neutral oil. Attention was called to the American Oil Chemists' Society recent methods for determining neutral oil. Work done 20 years ago by one person indicated that he could then vary the neutral oil by as much as 30 lbs. per ton by changing conditions. The material balance test shows that one can get low residual with no excessive oil losses. No analyses were obtained for nitrogen in the crude oil produced in this test. The plant where this mill scale balance was made showed a 1 lb. better oil balance for the season than the test period showed. Mill scale material balance tests should not extend over a long period of time. A week is probably long enough. Such a test means round the clock operation weighing and sampling accurately. In too long a period there may be a mixup and too short a period may not be sufficient for an accurate test.

In general, mills reporting losses of oil for the season are having exceptionally low oil refining loss. According to a break-even chart devised by one of the panelists a plant can afford to lose 2.4 lbs. of oil per ton of seed if it lowers refining losses 1%. According to many plant men, the evidence points to a milder cook if one wants to produce the expected amount of oil. One person on the panel said he would like to start at a temperature of from 170° to 185°F in the top kettle, cook with a moisture between 11 and 11-1/2% moisture without venting and have a total cooking time of about 50 minutes.

In reviewing the operating results of 4 different mills (hydraulic and expeller) in the Southwest for 20 years, one mill operator found the following to hold: For all four mills the unaccounted losses were unusually low, when the oil content of the seed was low and when the oil content of the seed was high the oil losses were high. It was suggested that this might have been a moisture rather than an oil condition, but there was no moisture data on the seed available in this study. It was recommended that if possible a correct correlation be established in this matter. It was brought out by another person who has correlated recent oil mill operations that a plant gets better hydraulic processing from seed containing about 10% moisture than from

seed containing 6 to 8% moisture. Whereas in screw pressing the reverse is true, better operation is obtained from seed containing 6 to 9% moisture. The latter was true except for one mill which operated on seed having 13% moisture.

In a discussion of what is being reported as oil and its methods of analyses, it was suggested that the composition of the lipides of the raw cottonseed and the extracted meals be studied, especially their phospholipides content. Last year at this meeting a report described the extraction of cooked and uncooked cottonseed meats to varying degrees of residual lipides. Higher yields of crude oil were obtained from the uncooked meats than from the cooked meat. The difference in yield consisted of non-oil components. The neutral oil yield was essentially the same. Also the amount of non-oil components increased appreciably with degree of extraction of the uncooked meats. The present analytical method for determining oil was developed a number of years ago when hydraulic pressing was the only method of processing used. At that time a number of solvents were tried to determine which was the most suitable. Every solvent will not yield the same percentage of oil from the seed; for example hexane will extract more than pentane. Skellysolve F was chosen because it gave results comparable with those then obtained at the various hydraulic press oil mills. With the advent of other types of extraction, a great many complicated considerations have been introduced but the same laboratory test procedures are used.

REPORTS ON DEVELOPMENTS IN THE CLEANING OF COTTONSEED BY: THE SOUTHERN DIVISION

By

L. L. Holzenthal
Engineering and Development Laboratory
Southern Utilization Research and Development Division

Improvements to the Differentiator were shown with 2 slides and its present performance was shown by a 3 minute ARS produced movie. Improvements included: Replacement of 3 stage opener with a 6 stage opener; modifications to this opener to improve performance; and adequate enclosures of the dual-belt system to prevent entrance of linters into belt grooves.

Improvements to the Magic Carpet device included installation of a constant weight conveyor-type motor driven feeder (loaned by Anderson Clayton and Co.) and a motor driven beater of our own design.

Performance of the Differentiator to date was illustrated with the following generalizations:

1. Using seed containing about 1.5% foreign material and about 10% linters, it is possible to project this material at feed rates up to about 150 tons per 24 hours and obtain recoveries of projected seed containing 0.5% and 0.75% foreign material equal to about 95% and 97%, respectively.

In addition, one-half the total foreign material can be collected in about 2.5% of the feed. The foreign material in the cleaned fractions consists mainly of stems and boll bases fractionated generally according to size.

2. Recoveries of projected feed are relatively sensitive to throughput rate, increases in foreign matter content and increases in linters content of seed above 10%. The effect of linters content was explored. The seed had a foreign matter content of 1.1% and, a linters content of about 10%. The percent recovery of seed containing 0.5% foreign material was about 83% at 150 tons per 24 hours, and 94% at 50 tons per 24 hours. This first-cut seed originally had about 2.8% foreign matter as received from the gin. It had a content of 12.1% as is generally associated with high trash content late harvested seed cotton. Higher recoveries of cleaned seed would be expected with first-cut seed containing 8% linters from cottonseed ginned early or in mid-season. Exploratory tests on the Magic Carpet showed that the horizontal arrangement was superior to the vertical for the removal of stems and shales.

Flooding of carpet at a given rate occurs at a lower feed rate with the vertical operation than the horizontal operation. With either method of operation stem fragments under 1/2 inch in length cannot be completely removed. Contamination due to this factor generally amounts to about 0.5%. The circular carpet in exploratory operation has demonstrated several weaknesses inherent in the vertical type in that it is sensitive to slight changes in feed rate, foreign matter content of feed, linters content, and flooding at relatively low feed rates. In addition, foreign matter particles remain in the descending seed stream longer than is desirable.

Results of these tests indicated that additional stems of 3/4 inch or possibly 1/2 inch in length would be removed with a carpet about 2 feet longer than the present one.

The Magic Carpet offers possibilities for cleaning of high trash content fractions from the Differentiator, and for specific types of foreign matter found to be most detrimental to second cut linters quality.

REPORTS ON DEVELOPMENTS IN THE CLEANING OF COTTONSEED BY: EQUIPMENT MANUFACTURERS

By

M. E. Ginaven
Bauer Brothers

Before discussing specific subjects, I would like to reconfirm my Company's attitude toward continued research in the cottonseed processing industry. We have a long range developmental program directed toward improving processing results through improved mechanical design of

existing machines and in the creation of new equipment. Much new equipment is going into foreign markets, in fact without export sales potential the vegetable oilseed industry is not at present a very attractive field for any large machinery manufacturer.

Phillips Filter Cleaner:

Both the Anderson Clayton and Company and The Bauer Bros. Co. have invested much time and talent on our joint two year experimental project at Littlefield, Texas. Our approach to the seed cleaning problem has been thorough, and while we have been a bit slow in getting our work done, we are not discouraged with the information assembled to date.

I think it is fair to conclude that the machine will achieve results as good as any cleaner we have ever seen. However, we have not been satisfied to commercially accept this new design on this basis for two reasons:

1. The machine is somewhat more costly to build than is our current No. 29 Cottonseed Cleaner, and it, therefore, must offer definitely proved advantages in performance before we could offer it for sale.
2. Even if the new machine was now ready for sale, the potential domestic market at this time would not justify the final design, tooling, and sales promotional costs.

It is our candid opinion that we can and should incorporate several of the excellent features of the experimental machine into the fan hood design of our present line of cleaners. Design work and coordinated laboratory studies on this plan are currently being carried out at Springfield.

Refinements to Existing Cottonseed Cleaners

About three years ago, Mr. M. C. Verdery reported on a design change that he and his associates at Lubbock, Texas, had successfully made on existing No. 199 Cleaners. This valuable improvement in cottonseed cleaning, with some minor changes, is now a well accepted feature of our No. 299 Cleaners. Although we experienced some fatigue failures on the first of these four shaker machines, we have had no adverse reports on performance; mechanical or otherwise, on our current design.

The principal cause of the parts failures on the No. 299 Cleaners, was excessive weights of the shakers and sash as related to the eccentric throw and speed. We still hold to the concept of primary stick and sand removal from cottonseed (and soybeans) by use of rubber mounted shakers, offset in a forward position, and moved by 3/4 inch throw eccentrics at 290 to 300 RPM. While we have observed some minor advantages in capacity and sand removal at higher speeds, we do not recommend any departures from standard factory instructions, unless compensating changes are also made, and understood, by the operators.

While we are on the subject of operational details, we wish to compliment Mr. Clark of Texas A+M College for the comprehensive study he conducted on the Bauer No. 199 Cleaner in their experimental laboratory.

We can confirm his findings with commercial data, but in spite of the reported advantage of 335 RPM eccentric shaft speed, we do not recommend it. Confidentially, there is a greater advantage than the one sighted in the report, and this one favors our repair parts department.

One new development we have in the field testing stage, is an all aluminum flange metal, or lip type perforation screen for the top shakers of the No. 199 or No. 299 Cleaners. This high tensile alloy is about 30 percent the weight of the standard steel flanged metal part, and offers additional advantages of being rustless, and will perforate with much smoother lipped holes than is obtainable in steel sheets. The absence or corrosion and sharp edges avoid fiber formations and resultant impairments to screening efficiency.

Exploratory work is underway to utilize aluminum rod screens of special design for sand and dirt removal. However, cost problems are somewhat of a handicap in this project.

No. 250 Soybean Cleaner:

In July, 1956, in cooperation with the Central Soya Company research engineers, we undertook a design program for a high capacity bean cleaner with the contemporary design features of our peanut and cottonseed cleaners.

Our approach to the design program was made by utilizing our more or less standard type of No. 240 Pre-cleaner shakers in our laboratory at Springfield. From the information gathered, we concluded that existing equipment was inadequate in capacity for the space requirements specified by our client, and so a completely new cleaner design was developed.

The prototype machine was designed and the first unit completed in about four months. After some minor changes were made, it has performed in a highly satisfactory manner, for over 7 months.

The compact design features two parallel shakers, each having two planes of screening area. The screens, or sash, are readily replaceable above sections of the shaker which house built-in "ball cage" sash assemblies. In this manner, we are able to obtain all the good features of our earlier ball cage screens without high cost and excessive weight. No doubt this construction can eventually be integrated into our cottonseed and peanut cleaners.

Capacity of the new machine is 60 tons per hour, or about 50,000 bushels per day. Sticks, stones, corn cockle burrs are removed on the upper deck of each of the two shakers and fine dirt with sand is screened out on the lower decks. Special aspiration hoods remove loose hulls, vine fragments and dust. Since soybeans are so highly abrasive, all assemblies are of bolted construction, so that replacement of worn parts can be readily and economically made.

No. 404 Defibrator Tests:

In February of last year, I had the pleasure of visiting the what surely must be the largest oil seed mill in the world, the J. Bibby and Sons Plant in Liverpool, England. To give you some

idea of the plant size, permit me to say that they operate 67 screw presses, along with one batch and one continuous solvent plant, right in the center of the city. The main mill building is 11 floors high, and the layout covers several city blocks. The plant operations are skillfully engineered and beautifully kept. When I was there, they were crushing flax seed, and bald cottonseed, but they also process palm, peanuts, copra, and linty cottonseed. I mention these details because these people operate four Bauer No. 404 Defibrators to make chemical grade cotton lint from hulls. By hammermilling the hulls on Bauer No. 192 mills before feeding them to the Defibrators, they have found that they could double the normal production and get better lint cleanliness. Actually, I believe that the Bibby engineers have been more thorough in their studies of lint defibrating than anyone else, anywhere, including Bauer Bros.

After seeing what improvements could be made by competent researchers on one of our own machines, we felt it was high time to do a comprehensive job of exploring variables on the Defibrator in our own Laboratory. We now have several months of test work completed and I for one am impressed with the potential of the old Reynell-Ware method of producing chemical lint.

Incidentally, our export sales of No. 404 Defibrators are nine times our domestic sales, which partially reflects the increasing interest abroad in producing dissolving pulp from cotton fiber.

<u>Cotton Lint for Pulp</u>:

While adequate seed cleaning is highly important in the manufacture of clean linters for any purpose, it should be pointed out that cotton fibers of paper making lengths can be thoroughly cleaned in the pulp mills by liquid cyclones, known commercially as Centri.Cleaners. These cleaning devices are now in commercial use, doing excellent work in cleaning dissolving pulps and writing paper furnish.

With the development of the Centri.Cleaners, and a new type of pressure type, or "pump through" disc refiner by our Company, we feel that the use of cotton linters in paper can be accelerated.

Incidentally, the wood pulp industry has learned something from the cotton and cottonseed processors, for wood is now being fiberized, pressed, dried, fluffed, and baled for transit to paper mills. The first of several new plants using what we call the Bauer-Bale system is making pulp in Montana, and shipping it in 90 percent dry fiber form in bale form, just like bales of cotton, to their paper mill in Saint Paul, at a savings of about 40 percent in their freight costs. This figure applies to groundwood type pulp and for N.S.S.C. or full cook chemical pulps, the savings can be even greater.

<u>Conclusion</u>:

Our Company is dedicated to the idea of using research to create better methods and equipment for the process industries, and we find it imperative to work development projects in close coordination with the commercial operation, of some manufacturing plant. It takes a lot of people and money to do this, but we have increased our business over 20 times in a period of 20 years, through this approach to manufacturing and selling machinery. We find it increasingly important to combine know-how and enthusiasm to get a job done properly, and to team up with organizations such as this group who are interested in new ideas.

REPORT ON DEVELOPMENTS IN THE CLEANING OF COTTONSEED: BY OIL MILLS

By

J. H. Brawner
Southern Cotton Oil Company
(Presented by Walton Smith)

This past season has seemed to me to be one of the roughest that we have had during the thirty years that I have been in the oil mill business. Judging from my own experience, not many people in our industry have had much chance to think about seed cleaning or to experiment with seed cleaning.

If you will bear with me I will tell you about some of the things we have noticed during this widely varied season. Because of the severe conditions, very often mills, equipment, and men were tested right up to the breaking point. Our troubles in producing clean seed and clean lint were the results of the equipment inadequacies, our failure to operate equipment at the high peak of efficiency demanded by wet dirty seed, or of having seed in such impossibly poor condition that prime products could not be made from them.

In past years, all of us have blown hot and cold with respect to the use of boll reels and many of us have removed them. This year, where we needed to work the maximum tonnage of very wet seed we found boll reels of great help as skimming devices to remove wet stringy cotton and trash that severly blinds pneumatic cleaner shakers. If you have any chance of ever having to crush seed of 18% to 25% moisture, I suggest that you think a long time before you take the reels out.

Perhaps one standard boll reel per one hundred tons of daily crush is the minimum capacity you should have.

In some of our past discussions at these meetings, I have recommended that we use one standard two-shaker fifty four-inch cleaner for each forty to fifty tons per day of cottonseed. During this past season, we found this to be just about the minimum required. With four effective shakers per pneumatic cleaner, I am sure that the capacity of each cleaner will be increased.

In connection with the discussion of the use of pneumatic cleaners, let me bring out several points that have been mentioned before, but that need emphasizing again.

In a battery of several cleaners it is very important that all be kept uniformly loaded. The most effective way of keeping a battery of cleaners uniformly loaded is to drive all of the feeders from a small counter shaft and to drive the counter shaft with a small variable speed motor.

Most pneumatic cleaners have had deep flutings which cause slugs of seed to fall on the shakers. During periods when trash is wet and when wet cotton is mixed with the seed, many of the slugs do not disintegrate but pass on off the end of the shaker with the bolls and sticks. I sometimes wonder if a staggered fluted feeder such as is used on linters would not be satisfactory on a pneumatic cleaner. The effectiveness of pneumatic cleaner shakers depends to a large extent on the size of the perforations. Three-fourth

inch perforations will let a tremendous amount of trash go with the seed. One-half inch perforations do a very noticeably better job, and if conditions permit three-eighths inch perforations should be used.

Many people have used larger perforations than necessary on pneumatic cleaners because they were obsessed with the fear that some wooly seed would go over the end of the shaker with the trash. When using extremely small perforations this danger can be offset to a large extent by putting good air pick up nozzles at the end of the shaker so that grabbots and wooly seed will be lifted out of the trash. Scalped grabbots and wooly seed can be put through a small grabbots cleaner and the separated cleaned material returned to the cleaned seed from the pneumatic cleaners. We have found this type of operation very satisfactory.

I suppose the main reason for thoroughly cleaning cottonseed is to permit production of saleable lint. Thorough seed cleaning is, of course, the best way to insure production of good first cut lint, but a linter is a good cleaning machine and will separate a surprisingly large amount of trash from the fibers, if adjusted properly. Previously I have recommended a designed capacity of 16.2 tons of cottonseed per 176-saw linter per 24-hours for maximum efficiency under the worst possible conditions. I now believe that approximately 15 tons per 176-saw first cut linter per day is far more desirable.

As far as second, third, and fourth-cut linters are concerned I have no reason for changing from our original figure of 7.22 tons per 176-saw linter per 24-hours. This does not mean that you should necessarily have the same number of second-cut linters as third-cut linters or as fourth-cut linters in a mill.

Undesirable material is apparently generated between groups of linters. Very few people do much about this situation. I recommend to you that you think about ways and means of cleaning seed before they enter the second cut linters, and possibly before they enter third cuts or fourth cuts.

REPORT ON CURRENT UTILIZATION OF LINTERS

By

Frank D. Barlow, Jr.
Market Development Branch
Agricultural Marketing Service

Over the last decade the relative percentages of chemical linters and felting linters consumed domestically have been stable with chemical linters accounting for approximately 61 percent of total domestic consumption and felting linters accounting for the remaining 39 percent.

Trends in the utilization pattern since 1948, show significant market losses in the production of rayon and acetate, and somewhat smaller losses in plastics. If this market is to be held, linters pulp must compete directly with dissolving wood pulp in the production of high tenacity rayon on the basis of relative prices.

Linters pulp has lost heavily in the production of acetate fibers, declining from 12 to 14 percent of the total domestic linters market 8 to 10 years ago to less than 5 percent in the last few years. Part of this loss was the result of the decline in acetate production and part was the result of greater substitutability of wood pulp.

With the exception of the abnormally large consumption of cotton linters in nitro-cellulose products during and right after the Korean War, this market has been relatively stable over the last decade accounting for about 5 percent of domestic linters consumption. However, wood pulp is expected to provide more competition in this market in the years ahead. The market for cellulose ethers has also been relatively stable accounting for slightly more than 2 percent of domestic consumption since 1948. The use of chemical grade linters in paper making has more than doubled, increasing from less than 3 percent of total linters consumption in 1948 to approximately 6 percent in the last 2 years.

Exports of purified linters have risen significantly over the last decade accounting for over one-third of total bleached linters since 1953, as compared to about one-fifth during the 4 year period 1948-51. Foreign producers have lagged technologically behind U. S. producers in supplying high alpha content wood pulp. In the last 2 or 3 years high alpha content wood pulp has been exported in increasing quantities and is effectively competing with linters pulp abroad in the production of high tenacity rayon, acetate and cuprammonium rayon.

Year to year variations in the consumption of felting linters have ranged from 37.3 percent of total linters consumption in 1951-52 to a high of 44 percent in 1956-57. For the first 4 months of the current season domestic consumption of felting linters is running about 50 percent of total domestic consumption.

Mattress felts and beddings are the most important outlets for felting linters, rising slightly from some 15 percent of the total linters consumed domestically during the 4 year period 1948-51 to slightly more than 18 percent in the most recent 4 year period. Automobile batts and padding are the second most important outlets for felting linters, accounting for approximately 9 percent of the total domestic consumption. The use of felting linters in furniture stuffing and padding has declined from nearly 10 percent of the total market in 1948 to less than 5 percent in 1955. Use of foam rubber has increased in high priced furniture because of its promotional advantage while cheaper padding materials have been used in lower priced items. The volume of felting linters used in paper making has more than tripled from the equivalent of 15,000 bales in 1948-51 to some 48,000 bales in 1955, now accounting for slightly more than 2 percent of the total domestic linters consumption.

U. S. exports and imports of cotton linters are highly significant to the domestic utilization pattern. Since 1953 exports of raw linters and the raw linters equivalent of purified pulp exports have exceeded imports by nearly 500,000 bales annually (equivalent

500 pound, gross weight). Raw linters exports over the last 4 years averaged approximately 375,000 bales annually. The export demand for raw linters for chemical purposes over the next few years appears bright.

RECENT DEVELOPMENTS IN THE USE OF LINTERS FOR PAPERMAKING

By

James J. Spadaro

A dollar bill is called paper money because it is actually made of paper--100% rag content paper. Paper money is folded, crumbled, soiled, abrased, and, in general, takes a terrific beating during its short life time.

Other rag content papers, examples of which are fine writing papers, bonds, ledgers, onion skin, drawing papers, etc., also require strength characteristics to varying degrees as well as durability, pliability, firm surface, close texture, ability to take a hard size, and feel. Papermakers have been able to attain these characteristics by using rag clippings from textile mills.

Paper mills have been faced with the problem of obtaining suitable rag clippings primarily because cotton is increasingly admixed with synthetic fibers, and resins that are practically impossible to remove. A large batch of pulp can be ruined by the presence of a very small amount of this foreign material.

The utilization of linters in paper has increased appreciably during the past several years. Linters constituted 16% of the total in 1949, as compared to an average of 34% in the past two years. This increase has been attained despite the fact that there has been a 20% decline in production of rag content writing papers as compared to more than 40% increase for wood pulp writing paper during the past 10 years.

The amount of linters used in paper depends upon two important factors--the cleanliness of linters and strength characteristics that can be developed from linters.

The production of cleaner linters is certainly an important factor in increased linter utilization in papermaking. Improved methods of cooking linters by bleachers and paper mills coupled with the production of cleaner linters, has also contributed to the increased utilization of linters. Harsher cooking conditions tend to degrade the linter fiber, and therefore decrease its strength characteristics for papermaking.

Efforts have been made by equipment manufacturers to improve the strength characteristics of linters mechanically by hydrating and refining in different types of equipment. Paper mills have been able to meet some of the strength specifications of the 25 and 50% rag- or cotton-content papers by using extra strong wood fibers (some of which are imported) to help meet the specifications. This has also contributed to increased use of linters.

Paper mills have not been able to develop from linters the strength characteristics which they can obtain from rag clippings.

Chemical modification of linters to improve strength characteristics has been the most recent and most promising approach. The Institute of Paper Chemistry as well as bleachers, paper mills, and this Laboratory are investigating chemical treatments of linters for this purpose.

A cooperative study between the Southern Regional Research Laboratory and the Crane and Company (manufacturers of rag content papers) was undertaken to investigate three chemical treatments -- cyanoethylation, hydroxyethylation and decrystallization. First-cut linters were used for the cyanoethylation and decrystallization studies and second-cuts for the hydroxyethylation studies.

Decrystallization showed decrease in strength characteristics; cyanoethylation showed an increase in strength characteristics and a desirable decrease in the hydration beating time but these were not considered significant for commercial adoption; hydroxyethylation showed appreciable strength increases and significant decrease in beating time to attain the desirable hydration. Hydroxyethylation has definite commercial possibilities from a technological viewpoint.

It is the development of these chemical treatments that offer the greatest promise for further increases in the utilization of linters for papermaking.

SUMMARY OF THE PANEL DISCUSSION ON CLEANING OF COTTONSEED AND UTILIZATION OF LINTERS

The cleaning of cottonseed at oil mills to yield cleaner linters is still a major problem confronting the cottonseed industry. During the current year, the oil mills had to meet other serious problems stemming from the poor quality and high moisture content of cottonseed, and the short crop, which diverted emphasis from cleaning of seed and linters. The consensus was that cleaning equipment can do a far better job when it is not overloaded, and when carefully operated.

All cuts of linters this season are moving well. There are no great surpluses, and, due to the short crop, there are some indications that a shortage of linters, specially second-cuts is possible. The outlook for the increased use of linters for papermaking is good, particularly for second-cuts in rag-content paper in which linters has constituted up to 35% of the total rag or cotton fiber used. This market has been on the upgrade since 1952. To compete with wood pulp, linters of greater strength and cleanness are needed. The market will depend on price.

Bleachers and other users of linters, including papermakers, have given more attention to cleaning linters, and have made considerable progress in this direction in recent years.

In spite of the above, the consensus of opinion was that research is required to upgrade the quality of cottonseed linters at the oil mill. This still points to the need for the development of suitable equipment for adequately cleaning the seed. An area which looks promising is cleaning of the cottonseed after the first-cut linter has been made, and probably also after the second cut. Removal of 20-25% of the linters in the first cut facilitates the removal of the remaining trash from the seed before subsequent delintering for producing second-cuts.

First-cut linters are used as stuffing for mattresses and padding for furniture and automobile upholstering, and for these uses, cleaning is not as critical as for the production of chemical cellulose. What is needed are linters that are cleaner, longer, and harsher. We are going to consume more felting linters in this country that we can produce. Indications are that by 1959, there will be about 1,500,000 tons of wood pulp capacity as compared to about 850,000 at present. Wood pulp capacity is running 4-5 years ahead of the present demand. Foreign countries are finding they can do as good a job with high-grade wood pulp as with high tenacity linter pulp.

It was emphasized that most of the trash impurities in linters are actually manufactured in the delintering machines, and that although hull pepper and other fine trash can be removed rather readily by linters beater, it is very difficult to remove the bulk of the hull pieces, bark splinters, and small sticks, as these cling tenaciously to the fibers.

At the pilot plant demonstration of the SURDD seed cleaning equipment units held after the meeting, considerable interest was expressed in the operation of the Differentiator and the Magic Carpet machines, and the cleaning results reported to date.

Mr. M. E. Ginaven, Vice President of Machinery Sales of Bauer Brothers Company, discussed ways and means to further clean the high-trash, small seed containing fractions which collect within 25 feet of the Differentiator. He was of the opinion that it may be possible to do a good seed separating job on this fraction with a Bauer Brothers Separator unit, and that the residual material (after seed recovery) could be sent to a Reynell-Ware machine to recover a crude grade of linters fiber, and a fraction for protein control.

With regard to the relative effectiveness in degrading linters quality of each of the five principal types of foreign matter occurring in cottonseed, Mr. L. N. Rogers, Buckeye Cellulose Corporation, and Mr. O. M. McClure, Southern Chemical Cotton Company both agreed that all types are equally and definitely objectionable although in somewhat different ways, and that for all practical purposes, all types should be removed as completely as possible from the seed.

The following resolutions to the Association were unanimously adopted:

1. Be it Resolved -- That we express our appreciation to Lawrence Hodges, and his program committee composed of Messrs. Brawner, Fowler, Gastrock, Long, Norris, Smith, Quinn and Verdery, for a very splendid and instructive program; also to Mr. James Hicky, Pres., Clarence Garner, Secty. and R. F. Patterson, Research Committee, Chairman of Valley Oil Processors' Assn. and all who have appeared on our program.

2. Be it Resolved -- That we extend to Dr. Fisher and his staff our appreciation for their continued contribution to this Clinic and for the many courtesies shown us.

3. Be it Resolved -- That in the new alignment of SURDD that we hope the services of Mr. E. A. Castrock will continue to be available to this industry, as he has been most helpful in improving the manufacturing processes in the industry, understands our practical problems, and has always been able to "talk our language" and we feel we would like to recognize his contribution.

4. Be it Resolved -- That we think it most urgent and important that additional "Materials Balance" programs be conducted on different screw press type oil extraction methods and conditions.

5. Be it Resolved -- That these Processing Clinics have been of great value to the industry with ultimate result of increased prices for cottonseed to farmers and also have been of great value in demonstrating our need for research and in our opinion should be continued each year --------

Signed: ______________________________
RESOLUTIONS COMMITTEE

J. B. Perry, Jr., Chairman
Ralph Woodruff
John Bookhart
J. R. Mays, Jr.

February 3-4, 1958

- - - - - - - - - - - - - - - PROGRAM - - - - - - - - - - - - - - -

February 3, 1958 - 9:30 a.m. — G. E. Goheen, Chairman, SURDD
Auditorium - Third Floor

I.	9:30 a.m.	Opening Remarks	C. H. Fisher, Director, SURDD James Hicky, President, VOPA
II.	10:00 a.m.	Developments in Improving the Nutritive Value of Cottonseed Meals for Poultry	
		Resume' of Feeding Tests	V. L. Frampton, Oilseed Section, SURDD
	10:20 a.m.	INTERMISSION	
III.	10:40 a.m.	Significant Differences between Cottonseed and Soybean Meals from the Standpoint of Animal Nutrition.	

		(a) Investigator's Point of View	Carl Lyman, Texas A. and M. College
		(b) Producer's Point of View	Garlon Harper, NCPA
		(c) Feed Manufacturer's Point of View	H. L. Wilcke, Ralston Purina Company
IV.	11:40 a.m.	Panel Discussion	A. M. Altschul, Moderator, Oilseed Section, SURDD Panel composed of speakers for Items II and III, and W. G. Quinn, Buckeye Cotton Oil Division Buckeye Cellulose Corporation
	12:20 p.m.	Luncheon at SURDD	

February 3, 1958 - 1:20 p.m. — E. F. Pollard, Chairman, SURDD

V.	1:20 p.m.	What the Clinic Means to Oil Milling Industry	Ralph Woodruff, Delta Products Company
VI.	1:40 p.m.	Prospects for Improving the Quality of Cottonseed Oil	Frank G. Dollear, Oilseed Section, SURDD
VII.	2:00 p.m.	Report on Development of a Gossypol-Free Cottonseed	Scott McMichael, U. S. Cotton Field Station, ARS
VIII.	2:20 p.m.	Benefits Resulting from Integrating Oil Processing and Extraction Operations at Cottonseed Oil Mills.	W. C. Whittecar, Plains Cooperative Oil Mill
IX.	2:40 p.m.	Material Balances at Cottonseed Oil Mills	(a) C. L. Hoffpauir, AP Section, SURDD (b) P. H. Eaves, ED Section, SURDD
X.	3:20 p.m.	Panel Discussion	E. A. Gastrock, Moderator, ED Section, SURDD Panel composed of speakers for Items VI, VII, VIII, IX, and J. J. Spadaro, ED Section, SURDD Tom S. Pryor, Continental Gin Company J. B. Perry, Jr., Mississippi Cottonseed Products Company Allen Smith, Perkins Oil Company

February 4, 1958 - 9:00 a.m.			Robert F. Patterson, Chairman, Research Committee, VOPA Lawrence H. Hodges, Chairman, Program Committee, VOPA
XI.	9:00 a.m.	Reports on Developments in the Cleaning of Cottonseed by:	
		(a) Southern Division	L. L. Holzenthal, ED Section, SURDD
		(b) Equipment Manufacturers	M. E. Ginaven, Bauer Brothers
		(c) Oil Mills	Jim Brawner, Southern Cotton Oil Company (Presented by Walton Smith)
XII.	10:00 a.m.	Report on Current Utilization of Linters	Frank D. Barlow, AMS
	10:20 a.m.	INTERMISSION	
XIII.	10:40 a.m.	Recent Developments in the Use of Linters for Papermaking	J. J. Spadaro, ED Section, SURDD
XIV.	11:00 a.m.	Panel Discussion	H. L. E. Vix, Moderator, ED Section, SURDD Panel composed of speakers for Items XI, XII, and XIII, and C. M. McClure, Anderson Clayton and Company
XV.	12:00 m.	Report of Resolutions Committee	
XVI.	12:15 p.m.	Resume' and Announcements.	
		ADJOURNMENT.	
	12:30 p.m.	Luncheon at SURDD	
	AFTERNOON	Pilot plant demonstration of new cottonseed cleaning developments.	
		Visits with SURDD personnel.	

February 3-4, 1958

ATTENDANCE LIST

Allen, T. E., The Southern Cotton Oil Co., New Orleans, La.
Anderson, R. F., Delta Cotton Oil Co., Jackson, Miss.
Baker, T. H., Jr., 1519 Harbert Ave., Trenton Cotton Oil Co., Memphis, Tenn.
Barlow, T. J., P. O. Box 521, Abilene, Tex.
Bialock, Hill, Riverside Oil Mill, Marks, Miss.
Bookhart, John, 4546 Kings Highway, Jackson, Miss.
Brassell, George W., Western Cottonoil Co., Lubbock, Tex.
Brawner, J. H., Wesson Oil + Snowdrift Co., New Orleans, La.
Bredeson, Dean K., French Oil Mill Mchy. Co., 4778 Normandy Ave., Memphis, Tenn.
Caldwell, C. H., West Memphis Cotton Oil Mill, West Memphis, Ark.
Campbell, C. R., Chas. R. Campbell Co., 4532 Livingston, Dallas, Tex.
Cantrell, W. C., Bauer Brothers Co., 4220 Selkuk Dr., Ft. Worth, Tex.
Charlock, M. C., Wm. Charlock, Ltd., London Rd. Mile End, South Australia
Coleman, W. T., Western Cottonoil, Abilene, Tex.
Doughtie, R. T., Jr., USDA-AMS, Memphis, Tenn.
Dunklin, George, Planters Cotton Oil Mill, Pine Bluff, Ark.
Durham, Warren A., Sr., Tristate Blow Pipe Co., 835 Tchoupitoulas St., New Orleans, La.
Earle, I. P., USDA-ARS, Beltsville, Md.
Farrell, F. H., Osceola Products Co., Osceola, Ark.
Feaster, Guy F., PTC Cable Co., 871 Vance Avenue, Memphis 5, Tenn.
Fowler, M. H., The Buckeye Cotton Oil Co., 6525 Brockenbridge, Cincinnati 13, Ohio
Frazier, W. O., Osceola Products Co., Osceola, Ark.
French, A. W., The French Oil Mill Machinery Co., Piqua, Ohio
Gandy, Dalton E., Nat'l. Cottonseed Products Assn., 907 Roberts, Ruston, La.
Garner, C. E., Valley Oilseed Processors' Assn., 1024 Exchange Bldg., Memphis, Tenn.
Gaulding, E. A., Buckeye Cellulose Corp., 745 Primrose Avenue, Jackson, Miss.
Ginaven, M. E., Machinery Sales, The Bauer Bros. Co., Springfield, Ohio
Harper, Garlon A., Director, National Cottonseed Products Assn., Inc., 618 Wilson Bldg., Dallas 1, Tex.
Geismar, Alfred, Geismar Co., Inc., 316 Baronne St., New Orleans, La.
Hay, Charles, 11426 Mullins Dr., Houston, Tex.
Helm, C. R., Continental Gin Co., 212 Poplar, Memphis, Tenn.
Hicky, James, Forrest City Cotton Oil Mill, Armour + Co., Forrest City, Ark.
Hodges, Lawrence H., Barrow Agee Laboratories, Inc., Memphis, Tenn.
Hodgin, W. L., 111 Sanford Avenue, Jackson, Miss.
Howard, Noland, Yazoo Valley Oil Mill, Greenwood, Miss.
Hutchins, R. P., French Oil Mill Mche. Co., Piqua, Ohio
Jenkins, Alfred, Delta Cotton Oil + Fertz Co., Jackson, Miss.
Lazare, Rene J., Jr., Southern Cotton Oil Co., New Orleans, La.
Cambier, Raoul J., Proctor + Gamble, Brussels, Belgium
Dunklin, I. W., Planters Cotton Oil Mill, Pine Bluff, Ark.
Jones, O. J., Western Cotton Oil Co., Abilene, Tex.

Kontz, E. C., Davidson-Kennedy Co., P. O. Box 2397, Atlanta, Ga.
Lanier, W. P., The Buckeye Cellulose Corp., Memphis, Tenn.
Lundmark, J. C., The V. D. Anderson Co., 1935 West 96 St., Cleveland, Ohio
Lyle, E. S., Dyersburg Oil Mill Co., P. O. Box 157, Dyersburg, Tenn.
Lyman, Dr. Carl, Texas A. + M. College, College Station, Tex.
Manley, W. C., Jr., 811 Falls Bldg., Memphis 3, Tenn.
Mason, E. C., Planters Oil Mill, Greenwood, Miss.
Mays, J. R., Jr., Barrow Agee Laboratories, Inc., Box 156, Memphis, Tenn.
McCaskill, Oliver L., Cotton Ginning Lab., Leland, Miss.
McClure, C. M., Anderson Clayton and Co., Houston, Tex.
McClure, O. M., Southern Chemical Cotton Co., Chattanooga, Tenn.
McGinnis, A. S., Swift + Company, Chicago 9, Ill.
McKinney, W. D., Buckeye Cellulose Corp., Memphis 8, Tenn.
McMichael, S. C., Crops Research Div., ARS, Shafter, Calif.
Miller, R. D., Minden Cotton Oil + Ice Co., Ldt., Minden, La.
Milner, R. R., The Buckeye Cellulose Corporation, 2899 Jackson Ave., Memphis 8, Tenn.
Moore, N. Hunt, 2065 Union Ave., Memphis, Tenn.
Moreland, C. B., Skelly Oil Co., Memphis, Tenn.
Page, Bentley H., Western Cottonoil Company, Lubbock, Tex.
Patterson, Robert F., Trenton Cotton Oil Co., Inc., Box 332, Trenton, Tenn.
Perry, J. B., Jr., Mississippi Cottonseed Products Co., Grenada, Miss.
Printup, Charles, Carver Cotton Gin Co., Memphis, Tenn.
Pryor, Thomas S., Continental Gin Co., Box 2614, Birmingham 2, Ala.
Quinn, W. G., Buckeye Cellulose Corp., Memphis, Tenn.
Ripple, Wm. M., Nat'l. Blowpipe + Mfg. Co., 1641 Poland Ave., New Orleans, La.
Rogers, L. N., Buckeye Cellulose Corp., 2899 Jackson Ave., Memphis 8, Tenn.
Ryan, J. J., Jr., Buckeye Cellulose Corp., Memphis 8, Tenn.
Sale, O. H., Fert. Equipt. Sales Corp., Atlanta, Ga.
Shaw, Charles S., U. S. Cotton Ginning Research Lab., Leland, Miss.
Simpson, George R., Miss. Oil Mills, Inc., Greenwood, Miss.
Smith, Allen, Perkins Oil Company, Box 152, Memphis, Tenn.
Smith, F. H., Prof., N. C. State College, Raleigh, N. C.
Smith, R. E., Yazoo Valley Oil Mill, Inc., Greenwood, Miss.
Smith, Walton, Southern Cotton Oil Division, Wesson Oil Snowdrift Co. Inc., New Orleans, La.
Southall, Harry, Union Oil Company, Bunkie, La.
Stricker, G. E., A. T. Ferrell + Co., 1621 Wheeler, Saginaw, Mich.
Tedford, D. A., Producer Cotton Oil, Phoenix, Ariz.
Tenent, E. H., Jr., Woodson-Tenent Laboratories, Memphis, Tenn.
Wallace, W. C., Union Oil Mill, Inc., West Monroe, La.
Wallace, Wm. H., A. T. Ferrell + Co., Saginaw, Mich.
Weber, L. J., Skelly Oil Co., Kansas City, Mo.
Whittecar, W. C. Bill, Plains Cooperative Oil Mill, P. O. Box 509, Lubbock, Tex.
Whitten, Marion, 3819 N. 24th St., Arlington 7, Va.
Wilcke, H. L., Ralston Purina Co., 835 S. 8th St., St. Louis, Mo.
Woodruff, Ralph, Delta Products Co., Evadale, Ark., P. O. Wilson, Ark.
Woodgard, Marshall, Delta Products Co., Wilson, Ark.
Yonak, Yasar, A. T. Ferrell + Co., Saginaw, Mich.
Fleming, J. D., Nat'l. Cottonseed Products Assn., P. O. Box 5736, Memphis 4, Tenn.

PRESS RELEASES

(These press releases of the Conference were furnished to various trade and technical journals and organizations, to the New Orleans newspapers and to a news bureau.)

Date, Program, for Seventh Annual Cottonseed Processing Clinic Are Announced by Sponsors (Program Attached) — December 19, 1957

Leaders in research and industry will present the newest developments on a number of subjects important to oil mill operators and feed manufacturers during the Seventh Annual Cottonseed Processing Clinic, according to the program for the meeting, which has just been made public. The Clinic, sponsored jointly by the Valley Oilseed Processors' Association and the Southern Utilization Research and Development Division of the Agricultural Research Service, USDA, will be held Feb. 3-4, 1958, at the Southern Regional Research Laboratory in New Orleans, La. Announcement of the 1958 Clinic was made by James Hicky, president of VOPA, and Dr. C. H. Fisher, Director of the Southern Division, who said that everyone interested is invited to attend.

Among the topics for discussion on the opening day, Feb. 3, will be: a resume' of the results of feeding tests on commercially-produced cottonseed meals; a comparison of significant differences between cottonseed and soybean meals for animal nutrition; prospects for improving the quality of cottonseed oil; a report on progress in the development of a gossypol-free cottonseed; and talks on oil mill operation. On Feb. 4, the morning program will include reports by research workers, equipment manufacturers, and oil mill operators on developments in the cleaning of cottonseed, and discussions on linters, particularly for papermaking. In order to obtain a well-rounded view, most of the subjects will be discussed by representatives of both research and industry.

Those who would like to have hotel reservations made for them should write E. A. Gastrock, Southern Utilization Research and Development Division, P. O. Box 7307, New Orleans 19, La., by Jan. 20, 1958, indicating the anticipated time of arrival, and the type of accommodations wanted.

Comparison of Cottonseed, Soybean Meals A Feature of Seventh Processing Clinic — January 21, 1958

Methods and conditions of processing are responsible to an appreciable degree of the difference in properties of cottonseed and soybean meals, yet in some important ways these two meals supplement each other as sources of protein in animal nutrition. These are two points which will be brought out by speakers in a discussion scheduled for the Seventh Annual Cottonseed Processing Clinic on differences between these two meals in animal feeding. Carlon A. Harper, Director of the Research and Educational Division of the National Cottonseed Products Association, Inc., will give the producer's view of the question; Dr. Harold L. Wilcke, Assistant Director of Research for the Ralston Purina Co., will speak for the feed manufacturers, and Dr. Carl M. Lyman, Head of the Department of

Biochemistry and Nutrition, Texas A+M College, is to present findings of the research scientist. Dr. V. L. Frampton's (SURDD) resume' on feeding tests will be the feature of the section on developments in improving the nutritive value of cottonseed meals for poultry.

The Clinic is to be held Feb. 3-4 at the Southern Regional Research Laboratory in New Orleans, La., and is sponsored by the Valley Oilseed Processors' Association and the Southern Utilization Research and Development Division of the Agricultural Research Service, USDA.

Since cottonseed and soybean meals are two of the chief sources of protein in animal feeds, this part of the program is expected to attract considerable interest. There will be a panel discussion following the formal talks, with W. G. Quinn, Buckeye Cotton Oil Division of the Buckeye Cellulose Corp., joining the speakers. Dr. A. M. Altschul, SURDD, will serve as moderator.

Several other topics which are receiving a great deal of attention in the cottonseed processing industry at this time are included on the program. Progress in the development of a cotton producing seeds which are free of gossypol is to be reported by Scott C. McMichael, geneticist with the U. S. Cotton Field Station, Crops Research Division, ARS, USDA. A portion of the program will be devoted to linters, with a report on recent developments in the use of linters for paper making by J. J. Spadaro, SURDD. F. D. Barlow, of the Agricultural Marketing Service, will report on current utilization of linters. H. L. E. Vix, SURDD, will serve as moderator for a panel discussion in which M. C. Verdery, Anderson, Clayton and Company will join the speakers.

Reports on developments in the cleaning of cottonseed will be made by L. L. Holzenthal, SURDD; M. E. Ginaven, Bauer Brothers, representing equipment manufacturers, and Jim Brawner, Southern Cotton Oil Co., the oil mills. Frank G. Dollear, SURDD, will outline prospects for improving the quality of cottonseed oil; W. C. Whittecar, Plains Cooperative Oil Mill, is to discuss benefits resulting from integrating oil processing and extraction operations in cottonseed oil mills, and C. L. Hoffpauir and P. H. Eaves, SURDD, are to present data on material balances at cottonseed oil mills. Ralph Woodruff, Delta Products Co., is to discuss the value of the Clinic to the oil milling industry.

The Monday afternoon session on oil mill operations will be followed by a panel discussion, members being the speakers, and also J. J. Spadaro; Tom S. Pryor, Continental Gin Co., J. B. Perry, Jr., Mississippi Cottonseed Products Co., and Allen Smith, Perkins Oil Co. E. A. Gastrock, SURDD, will serve as moderator.

Dr. C. H. Fisher, Director of SURDD, will open the sessions with a welcome, to which James Hicky, President of VOPA, will respond. Chairmen for the various sessions will be Dr. G. E. Goheen, and Dr. E. F. Pollard, SURDD, and Robert F. Patterson, Chairman, Research Committee, and Lawrence H. Hodges, Chairman, Program Committee, VOPA.

News From The Seventh Cottonseed Processing Clinic February 7, 1958

Definite progress toward a gossypol-free cottonseed was announced to the Seventh Annual Cottonseed Processing Clinic by Dr. Scott C. McMichael, geneticist with the U. S. Cotton Field Station, Shafter, Calif.

The Clinic, which is sponsored jointly by the Valley Oilseed Processors Association, and the Southern Utilization Research and Development Division of the Agricultural Research Service, USDA, met at the Southern Regional Research Laboratory in New Orleans, La., Feb. 3-4, with nearly 100 representatives of industry and research present.

Dr. G. E. Goheen, Assistant Director of the Southern Division, welcomed the visitors at the opening session, touching on new developments in cotton utilization research and on effects of the recent realignment in research functions and personnel in the Souther Division. James Hicky, president of VOPA, responded.

USDA plant breeders have succeeded in producing a strain of cotton which holds promise of eliminating many of the most serious problems of the cottonseed industry. This cotton has a seed which is free from pigment glands. The gossypol and other materials contained in the pigment glands has been one of the greatest drawbacks to the use of cottonseed meal for feeding non-ruminants, such as poultry and swine, a drawback which can be overcome only by careful processing to lower the gossypol content. The pigment glands frequently cause discoloration of the oil, lowering the grade and consequently the price. Dr. McMichael said they have successfully grown experimental plantings of a glandless seeded cotton, and are now engaged in breeding the glandless seed into commercial strains of cotton. This process will take several years of backcrossing before seed are available in commercial quanitites. Experimental tests indicate that meal from the glandless seed can be fed to laying hens, and that the oil will be much lighter in color than that from the gland-containing cottonseed. Tests are still necessary, however, it was brought out, to determine whether desirable properties of the seed and lint have been affected by the breeding processes which have eliminated the pigment glands.

During the program on nutritive values of cottonseed meals for poultry, Dr. V. L. Frampton, Head of Oilseed Meals Investigations at SURDD, presented some new information on cottonseed meal in the diet of laying hens, to the effect that off-color develops in stored eggs because the yolk becomes alkaline, and that the total gossypol content of cottonseed meal is directly proportional to the intensity of the egg color. He also said it has been found that lysine in cottonseed meals tends to counteract the color-inducing effects of gossypol.

In a discussion of differences in nutritive value for animal feeding between soybean and cottonseed meal, Garlon A. Harper, Director of the Research and Educational Division of the National Cottonseed Products Association, representing the producers, said that cottonseed and soybean meals are both competitive and complementary. As a protein concentrate for ruminants in cotton growing areas, cottonseed meal costs are usually lower, and its higher phosphorus content is an advantage when it is fed straight in phosphorus-deficient areas. Soybean meal is preferred in rations for non-ruminants, but feeding tests have indicated a combination of high-quality cottonseed and soybean meals produces equal or superior growth to that from either concentrate alone. Cottonseed meal contains slightly more methionine, the most critical of the amino acids in soybean meal, while the latter contains more lysine than the cottonseed meal.

Dr. H. L. Wilcke, Assistant Director of Research for the Ralston Purina Company, and Dr. Carl M. Lyman, Head of the Department of Biochemistry and Nutrition, Texas A+M College, also discussed comparative values of the two meals. All three speakers mentioned the higher fiber content of cottonseed meal as a disadvantage. Dr. Wilcke said that the physical characteristics of the two meals are affected by the method of processing. Cottonseed meals produced by the prepress solvent, or solvent extraction may be extremely low in fat, and quite dusty, but that meal produced from the soybean by the solvent method has much better handling characteristics, even though equally low in fat.

Dr. Lyman said raw soybeans contain a substance which blocks protein digestion in the animal, and also a growth inhibitor called soyin, but both are readily destroyed by moist heat treatment during processing, gossypol, the injurious substance in cottonseed, can also be inactivated by moist heat, but under certain milling conditions gossypol becomes bound to the protein, with a marked reduction in protein quality. It is much more difficult to maintain high protein quality during cottonseed processing than is the case with soybeans, Dr. Lyman said.

Reporting on recent progress toward improving the quality of cottonseed oil, Frank G. Dollear, of the Southern Division, showed samples of oil treated with diethylene triamine and untreated oil; the treated oil was much lighter in color than the untreated. He said the process is very promising, but is still in the experimental stages.

Only 39% of domestically-produced cotton linters go into the high-grade or felting-quality market, and 61% into the lower-grade, lower-priced chemical linters, while this country has imported about 175,000 bales of felting-grade linters annually since 1953, F. D. Barlow, representative of the Agricultural Marketing Service of the U. S. Department of Agriculture told the Seventh Annual Cottonseed Processing Clinic during their Tuesday morning session at the Southern Regional Research Laboratory.

Improvement in the quality of linters, the short fibers remaining on the cottonseed after ginning, is one of the industry problems under study by the cottonseed processors attending the Clinic. Barlow pointed out further in his discussion of linters marketing that the price for chemical linters in the future will be governed to a considerable extent by the price of cheaper materials, such as dissolving wood pulp, used for the same purposes.

Quality of linters can be improved greatly by better cleaning, declared J. J. Spadaro, of the Engineering and Development Laboratory of the Southern Utilization Research and Development Division in a discussion of linters for papermaking.

"Two oil mills that I know of have improved their cleaning operations to the extent that each mill has been able to sell its total linter output to one paper mill", he said.

The best quality commercial papers are made from cotton cellulose fiber, he said. Paper money is a 100% rag content paper; fine writing papers, bonds, ledger paper, and others also have a high rag content and this market is considered one of the most promising domestic outlets for

high grade linters. Spadaro reported on experiments in the use of cotton linters for papermaking, carried on by the Southern Laboratory in cooperation with one of the leading manufacturers of rag papers, saying the results were good.

The problem of unexplained oil losses in cottonseed processing came up for discussion again this year. C. L. Hoffpauir and P. H. Eaves, of the Southern Division, reported on materials balances run in a screwpress equipped mill. Representatives of Barrow-Agee Laboratories and the French Oil Machinery Company were present to observe and assist in the investigation. It was concluded that in this particular mill scale study, no evidence of excessive oil losses was found. Allen Smith, Perkins Oil Co., Memphis, presented results of another survey of oil losses in various commercial mills. From the data assembled during this and past years he suggested that major losses occur in cooking, and expressed the opinion that moisture levels of 11 - 11.5%, and starting temperatures of 175°, with a cooking time of about 50 minutes would be most favorable.

Integrated oil processing and extraction operations were discussed by W. C. Whittecar, general superintendent of the Plains Cooperative Oil Mill, Lubbock, Texas. He reported that addition of a water-wash degumming process has resulted in better products and additional revenue, enabling them to produce a higher fat meal with higher nutritive value, one that will pellet well, with a minimum of fines. The process removes gum or lecithin from the oil, and adds it back to the meal.

Among other topics of interest, recent developments in cleaning of cottonseed was discussed by L. L. Holzenthal, Southern Division; M. E. Ginaven, vice president, machinery sales, The Bauer Bros. Co., and Walton Smith, Snowdrift and Wesson Oil Co., who appeared instead of Jim Brawner, who was unable to attend. In this connection, on Tuesday afternoon, after the close of the formal meeting, improvements in the SRRL Differentiator for cleaning cottonseed, and the Magic Carpet Trash Remover were demonstrated in the pilot plant for the visitors. The Differentiator has been improved by the addition of a unit to accelerate the feeding of the seed into the machine. The machine, with a six-inch belt, can handle up to 150 tons per day, and starting with seed containing 1.5% foreign matter, can separate 95% of the seed with only .5% foreign matter. The Magic Carpet, a device using a travelling belt with a foam rubber surface to separate seed from sticks and other trash, is now in experimental stages, and a larger model is to be built soon. The smaller model demonstrated a high degree of efficiency in the cleaning of seed. Patent applications are being filed on the methods and devices.

At the close of the sessions, the resolutions committee, composed of J. B. Perry, Jr., Ralph Woodruff, John Bookhart, and J. R. Mays, Jr., turned in their report, which was adopted. They expressed appreciation to the Program Committee and officials of VOPA for their work, and to Dr. Fisher and the SURDD staff for their cooperation. In another resolution, they expressed the hope that "the services of Mr. E. A. Gastrock (SURDD) will continue to be available to this industry, as he has been most helpful in improving the manufacturing processes in the industry, and 'understands our practical problems, and has always been able to 'talk our language'". They also recommended further materials balance studies on the problem of oil losses.

Information will be given in greater detail in the Proceedings of the Seventh Annual Cottonseed Processing Clinic, which will be available in the near future.